Cisco ASR 903 Router Hardware Installation Guide

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C O N T E N T S

Cisco ASR 903 Router Hardware Installation Guide

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About this Book

The preface describes the revision history, audience, organization, and conventions of *Cisco ASR 903 Router Hardware Installation Guide*. It also lists sources for obtaining additional information and technical assistance from Cisco Systems.

- Document Revision History, page ix
- Document Audience, page ix
- Document Organization, page x
- Document Conventions, page x
- Obtaining Documentation and Submitting a Service Request, page xi

Document Revision History

The following table lists the major changes made to this document for each release.

Revision	Date	Change Summary
OL-25178-04	3 June 2013	Updated supported SFPs for IOS XE Release 3.9. 1
OL-25178-03	3 April 2013	Updated supported SFPs for IOS XE Release 3.9.
OL-25178-03	29 November 2012	Updated supported SFPs for IOS XE Release 3.8.
OL-25178-03	23 August 2012	Added material for AC power supply, chassis air flow information, and NEBS certification.
OL-25178-02	30 March 2012	Updated supported SFPs for IOS XE Release 3.6.
OL-25178-02	24 February 2012	Added power draw and installation torque values.
OL-25178-01	16 December 2011	First release published.

Document Audience

This guide is intended for users who are responsible for installing the Cisco ASR 903 Series Aggregation Services Router. It is intended for users who may not be familiar with the initial configuration and troubleshooting tasks, the relationship among tasks, or the Cisco IOS software commands necessary to perform particular tasks.

Document Organization

This guide includes the following chapters and appendix:

Title	Description
Chapter 1, "Cisco ASR 903 Router Overview"	This chapter provides an overview of the Cisco ASR 903 Router.
Chapter 2, "Preparing for Installation"	This chapter provides site preparation guidelines for installing the Cisco ASR 903 Router.
Chapter 3, "Installing the Cisco ASR 903 Router"	This chapter describes the Cisco ASR 903 Router and how to install it.
Chapter 4, "Cisco ASR 903 Router Initial Configuration"	This chapter describes how to start the Cisco ASR 903 Router and create an initial system configuration.
Chapter 5, "Troubleshooting"	This chapter provides LED and pinout information for troubleshooting purposes.
Appendix A, "Site Log"	This provides a site log for tracking the installation and maintenance activities of the router.

Document Conventions

This document uses the following conventions:

Convention	Indication
bold font	Commands and keywords and user-entered text appear in **bold** font.
italic font	Document titles, new or emphasized terms, and arguments for which you supply values are in *italic* font.
[ ]	Elements in square brackets are optional.
{x	y	z }	Required alternative keywords are grouped in braces and separated by vertical bars.
[x	y	z]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.
`courier` font	Terminal sessions and information the system displays appear in `courier` font.
< >	Nonprinting characters such as passwords are in angle brackets.
[ ]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

Note Means *reader take note*.

Tip Means *the following information will help you solve a problem.*

Caution Means *reader be careful*. In this situation, you might perform an action that could result in equipment damage or loss of data.

Timesaver Means *the described action saves time*. You can save time by performing the action described in the paragraph.

Warning Means *reader be warned*. In this situation, you might perform an action that could result in bodily injury.

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

Subscribe to the *What's New in Cisco Product Documentation* as an RSS feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service. Cisco currently supports RSS Version 2.0.

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Cisco ASR 903 Router Overview

The Cisco ASR 903 Router is a fully-featured aggregation platform designed for the cost-effective delivery of converged mobile and business services. With shallow depth, low power consumption, and an extended temperature range, this compact 3-rack-unit (RU) router provides high service scale, full redundancy, and flexible hardware configuration.

The Cisco ASR 903 Router expands the Cisco service provider product portfolio by providing a rich and scalable feature set of Layer 2 VPN (L2VPN) and Layer 3 VPN (L3VPN) services in a compact package. It also supports a variety of software features, including Carrier Ethernet features, Timing over Packet, and pseudowire.

The Cisco ASR 903 Router is positioned as a pre-aggregation router in IP RAN (GSM, UMTS, iMAX, CDMA, and LTE) networks or an aggregation router in Carrier Ethernet networks.

Cisco ASR 903 Router Features

The Cisco ASR 903 Router has the following hardware features:

- 3-RU modular chassis designed for installation in a 300 mm European Telecommunications Standards Institute (ETSI) cabinet
- Dedicated slots in the chassis that support the following:
  - Up to six interface modules
  - Up to two Route Switch Processors (RSP)
  - Up to two DC power supply units
  - One fan tray
- Network frequency, phase, and time inputs and outputs for network interfaces (SyncE and TDM), BITS, 1 PPS or 10 MHz and Timing over Packet (IEEE 1588-2008)
- Adjustable front and rear rail mounting locations
- Front panel access to power supplies, fan tray, RSPs, and interface modules
- Online insertion and removal (OIR) of RSP, interface modules, power supplies, and fan tray
- Discrete status LEDs on power supply, interface module, RSP, and fan tray units
- Four alarm dry contact inputs (either normally open or normally closed)
- Environmental monitoring and reporting functions
- LED indicators for critical, major, and minor alarms

- Side-to-side forced air cooling

- Temperature range of -40 to 149 degrees F (-40 to 65 degrees C) with DC power supply

- Temperature range of -32 to 104 degrees F (0 to 40 degrees C) with AC power supply

Figure 1-1 illustrates the Cisco ASR 903 Router chassis design.

Figure 1-1   Cisco ASR 903 Router Chassis Design
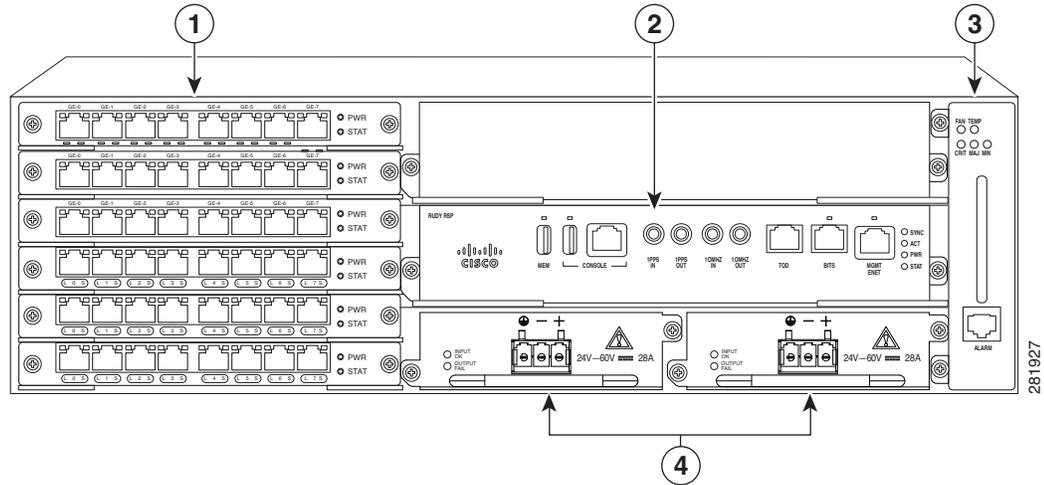
1	Interface modules
2	RSP unit
3	Fan tray
4	Redundant power units (two DC power units are shown)

System Specifications

Table 1-1 summarizes the system specifications and environmental requirements for the Cisco ASR 903 Router.

Table 1-1   Cisco ASR 903 Router System Specifications

Dimensions (Height x Width x Depth)	5.22 in. x17.44 in. x 10.565 in. (132.588 x 442.976 x 268.351 mm)
	Note This measurement includes handles from the power supply, fan tray, and interface modules installed in the chassis.
Weight	27.117 pounds (12.3 kg)
	Note This weight includes a redundant RSP and power supply.

Table 1-1   Cisco ASR 903 Router System Specifications

Operating Temperature	The Cisco ASR 903 Router supports the following temperature ranges with the DC power supply: • -60–4000 meters: -40 to 104 degrees F (-40 to + 40 degrees C) • -60–1800 meters: -40 to 149 degrees F (-40 to + 65 degrees C) The Cisco ASR 903 Router supports the following temperature ranges with the AC power supply: • -60—4000 meters:32 to 104 degrees F (0 to 40 degrees C) • -60—1800 meters: 23 to 140 degrees F (-5 to 60 degrees C)
Nonoperating Temperature	-40 to 158 degrees F (-40 to + 70 degrees C) storage temperature
Operating Humidity	5—95% operating noncondensing relative humidity Reviewers, is this number different for the AC PS? (SFS lists 10-90%)
Operating Altitude	Up to 4000 m operating altitude at up to 104 degrees F (40 degrees C) temperature
Nonoperating Altitude	4570 m storage altitude
Operating Vibration	0.41 Grms, 3 to 200 Hz/100 minutes per axis Sine: 10 to 500 Hz. @ 0.15 G peak 5 sweep cycles/axis GR-63-CORE earthquake resistance, Zone 4, shelf-level
Nonoperating Vibration	Random: 1.15 gRMS 3 to 200 Hz, 30 minutes/axis Sine: 10 to 500 Hz @ 0.8 G peak / 5 sweep cycles/axis
Operating Acoustics	< 55 dBa @ 27 degrees C

Power Supply Features

The Cisco ASR 903 Router support AC and DC power supplies. For more information about installing the Cisco ASR 903 Router power supplies, see the Installing the Power Supply, page 3-17 section. The power sections provide more information about the power supply:

- Redundancy, page 1-4
- Dying Gasp, page 1-4
- Status LEDs, page 1-4
- DC Power Specifications, page 1-4

- AC Power Specifications, page 1-5

Redundancy

The Cisco ASR 903 Router chassis includes a slot for an optional redundant power supply. The redundant power supply option provides a second, identical power supply to ensure that power to the chassis continues uninterrupted if one power supply fails or input power on one line fails. The Cisco ASR 903 Router supports current sharing between the power supplies.

If you install a redundant power supply on the Cisco ASR 903 Router, we recommend that you connect each power supply to a separate input power source in order to ensure that the router maintains power in the event of a power interruption caused by an electrical failure, a wiring fault, or a tripped circuit breaker.

Dying Gasp

The Cisco ASR 903 Router DC power supply supports the Dying Gasp feature, which allows the router to provide an input power loss notification to the RSP so that the RSP can send appropriate SNMP traps or OAM messages and update log files on the router. With the DC power supply, the router supports a minimum input power loss detection time of 2 milliseconds (DC) and continued operation of at least 6 milliseconds (DC) after the notification.

Note Continued DC power supply operation may vary for voltages other than +24/-48V.

Status LEDs

LEDs are also provided on each power supply to indicate the status of the input power and the health of the power supply. For more information about the LEDs on the Cisco ASR 903 Router, see Chapter 5, "Troubleshooting."

DC Power Specifications

The Cisco ASR 903 Router uses a +24/-48 Volts Direct Current (VDC) (-19 to -72 VDC supply tolerance) power supply. The power supply provides 550 W output power for system 12 V power. The power supply is field replaceable, hot-swappable, and operates separately from the fan tray.

The power supply uses a three-position terminal block-style connector with labeled connections for ground, -24/48 V, and +24/48 V. The power supply contains a front panel with mounting screws, a handle for insertion and removal, and two status LEDs. No ON/OFF switch is provided.

Table 1-2 summarizes the input power specifications for the Cisco ASR 903 Router DC power supply.

Table 1-2   DC Power Supply Specifications

Part number	A900-PWR550-D
Input power specification	+24/-48 VDC
Input voltage	-48/-60 VDC
Minimum input voltage	-19.2 VDC
Maximum input voltage	-72 VDC

Table 1-2   DC Power Supply Specifications

Part number	A900-PWR550-D
Input power specification	+24/-48 VDC
Input voltage	-48/-60 VDC
Minimum output voltage	-36/18 VDC
Maximum output voltage	-72/36 VDC
Wire gauge for DC input power connections	12 AWG minimum for -48/-60 VDC. 8 AWG minimum for 24 VDC. Connector accepts 8 AWG maximum.
Power dissipation	600 W

AC Power Specifications

Table 1-3   AC Power Supply Specifications

Part number	A900-PWR550-A
Input power specification	115VAC/ 230VAC
Input voltage	85/264 VAC
Minimum input voltage	85 VAC
Maximum input voltage	264 VAC
Minimum output voltage	12V
Maximum output voltage	12.4V
Power dissipation	600 W

Fan Tray

The Cisco ASR 903 Router uses a modular fan tray that is separate from the power supply. The fan tray contains twelve fans and provides sufficient capacity to maintain operation indefinitely in the event of an individual fan failure.

The fan tray has the following hardware features:

- It provides side-to-side forced air cooling
- It provides redundant fans
- It is field replaceable
- It contains status LEDs
- It contains an alarm port with four external alarm inputs

Figure 1-2 shows the fan tray.

Figure 1-2   *Cisco ASR 903 Router Fan Tray*
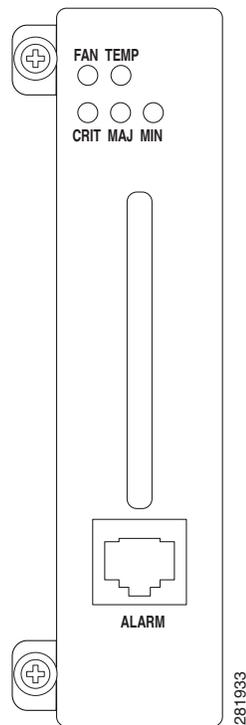
For more information about air flow guidelines, see Air Flow Guidelines, page 2-11. For instructions on how to install the fan tray, see Installing the Fan Tray, page 3-8. For a summary of the LEDs on the fan tray, see "LED Summary" section on page 5-7.

RSP Modules

The Cisco ASR 903 Router is designed to use up to two RSP modules to handle the data plane, network timing, and control plane functionalities for the router. The RSP configuration allows you to use Cisco IOS software to control chassis management, redundancy, external management, and system status indications on the router.

The following sections describe the Cisco ASR 903 Router RSP:

- Supported RSP Features, page 1-7
- RSP Redundancy, page 1-7
- Network Timing Interfaces, page 1-8
- RSP Interfaces, page 1-8

RSP features include:

- Loading software onto processor-based interface modules
- Redundant RSP management—The RSP manages detection of RSPs, exchange of health and status information, role negotiation, function for detection, health and status exchange, role negotiation
- Packet processing

- Traffic management, including buffering, queuing, and scheduling, Ethernet MAC functions

- Network clocking functions including phase and time-of-day for BITS, 1 PPS, 10 MHz, and 1588 PTP clock references.

- Storage of software images, system configuration, OBFL, SysLog

- PTP packet processing including IEEE 1588-2008 for recovering network timing (frequency, phase, and time) from upstream PTP clocks, for generating PTP frequency and phase references as inputs to the SETS, and for distributing them to downstream PTP clocks

- External management interfaces (RS232 console, management ENET, USB console, USB storage) and system status LED indicators

Supported RSPs

The Cisco ASR 903 Router supports the following RSPs:

- A900-RSP1A-55—Provides 2 GB of SDRAM, 5 Mb of TCAM memory, 3-Mb buffer table, 576-Mb forwarding memory, and 1,536-Mb packet buffer memory.

- A900-RSP1B-55—Provides 4 GB of SDRAM, 20 Mb of TCAM memory, 144-Mb buffer table, 1152-Mb forwarding memory, and 1,536-Mb packet buffer memory.

Note   The supported RSPs have different memory capacities, but they have the same interfaces and functionality.

Supported RSP Features

The RSP provides the following features on the Cisco router:

- Centralized data plane, timing, and control plane functions for the system

- High-level control of interface modules

- Management functionalities for the router

- Control plane (host) CPU and associated memory in which IOS-XE and platform control software runs

- Nonvolatile memory for storage of software images, configurations, and system files

- Enabling and monitoring the health and presence of fan trays, interface modules, and power supplies

- Field replacement and hot-swap capabilities

RSP Redundancy

The Cisco ASR 903 Router chassis includes two RSP slots to allow for redundant RSPs. When the router uses redundant RSPs, one RSP operates in the active mode and the other operates in the hot standby mode. Removal or failure of the active RSP results in an automatic switchover to the standby RSP.

Note   If you are using redundant RSPs, both the RSPs must be of the same type because a mixed configuration of two different RSP types is not supported.

Network Timing Interfaces

The RSP supports the following network timing interfaces:

- • BITS input/output port—RJ48 jack
- • 1 PPS input and output—Mini coax connectors
- • 2.048 or 10 MHz input and output—Mini coax connectors
- • Time of Day (ToD) or 1 PPS input or output port—Shielded RJ45 jack

Network timing interfaces support redundancy in a redundant RSP configuration. Network timing interfaces on a redundant RSP remain in operation while the RSP is in hot standby mode.

RSP Interfaces

Figure 1-3 summarizes the interfaces on the RSP module.

Figure 1-3   RSP Interfaces Summary
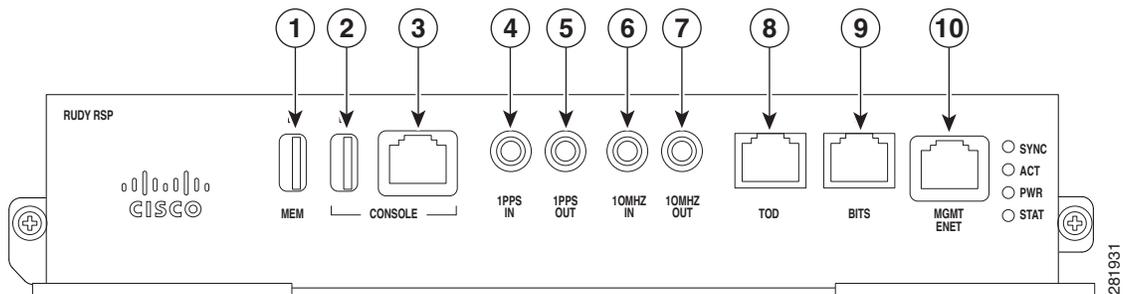
Label	Interface
1	USB memory port
2	USB console port
3	Console port
4	1 PPS input timing port
5	1 PPS output timing port
6	10 MHz input timing port
7	10 MHz output timing port
8	Time of Day (ToD) timing port
9	BITS timing port
10	Ethernet management port

For more information about installing the RSP, see RSP Installation, page 3-10. For more information about the RSP LEDs, see RSP LEDs, page 5-7.

Interface Modules

In addition to the ports provided on an RSP, the Cisco ASR 903 Router supports the following interface modules:

- Gigabit Ethernet SFP Interface Module, page 1-9
- Gigabit Ethernet RJ45 Interface Module, page 1-10
- 10 Gigabit Ethernet XFP Interface Module, page 1-11
- T1/E1 Interface Module, page 1-13
- OC-3 Interface Module, page 1-14

Note   For information about supported interface modules, see the *Release Notes for the Cisco ASR 903 Series Aggregation Services Router.*

Gigabit Ethernet SFP Interface Module

The Gigabit Ethernet Small Form-Factor Pluggable (SFP) interface module provides eight Gigabit Ethernet SFP modules. Figure 1-4 shows the 8 x 1 GE Gigabit Ethernet SFP interface module.

Figure 1-4   8 x 1 GE Gigabit Ethernet SFP Interface Module
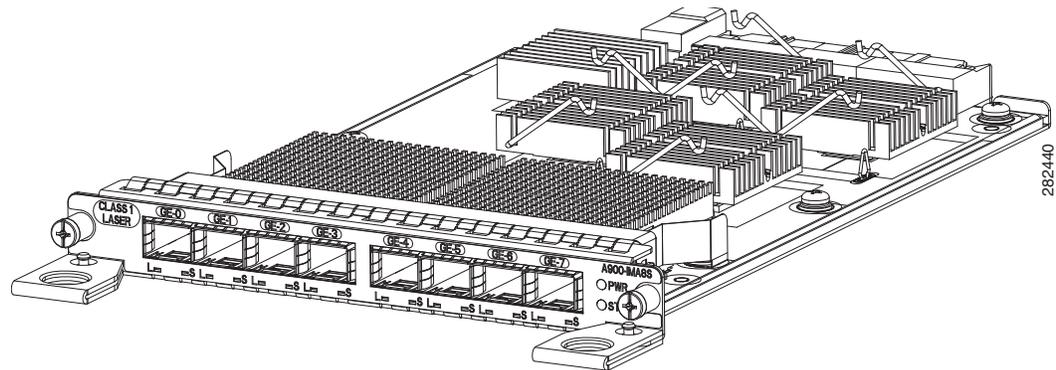
Supported SFP Modules

The Gigabit Ethernet SFP interface module supports the following SFP modules:

- GLC-BX-D
- GLC-BX-U
- GLC-EX-SMD
- GLC-FE-100BX-D
- GLC-FE-100BX-U
- GLC-FE-100EX
- GLC-FE-100FX
- GLC-FE-100FX-RGD

- GLC-FE-100LX
- GLC-FE-100LX-RGD
- GLC-FE-100ZX
- GLC-LH-SMD
- GLC-LH-SM-RGD
- GLC-SX-MMD
- GLC-SX-MM-RGD
- GLC-TE
- GLC-ZX-SMD
- GLC-ZX-SM-RGD
- SFP-GE-L
- SFP-GE-S
- SFP-GE-T
- SFP-GE-Z

For more information about installing a SFP Gigabit Ethernet module, see the "Interface Module Installation" section on page 3-14.

Gigabit Ethernet RJ45 Interface Module

The Gigabit Ethernet RJ45 interface module provides eight Gigabit Ethernet copper ports. Figure 1-5 shows the interface module.

Figure 1-5   *8 x 1 GE Gigabit Ethernet RJ45 (Copper) Interface Module*
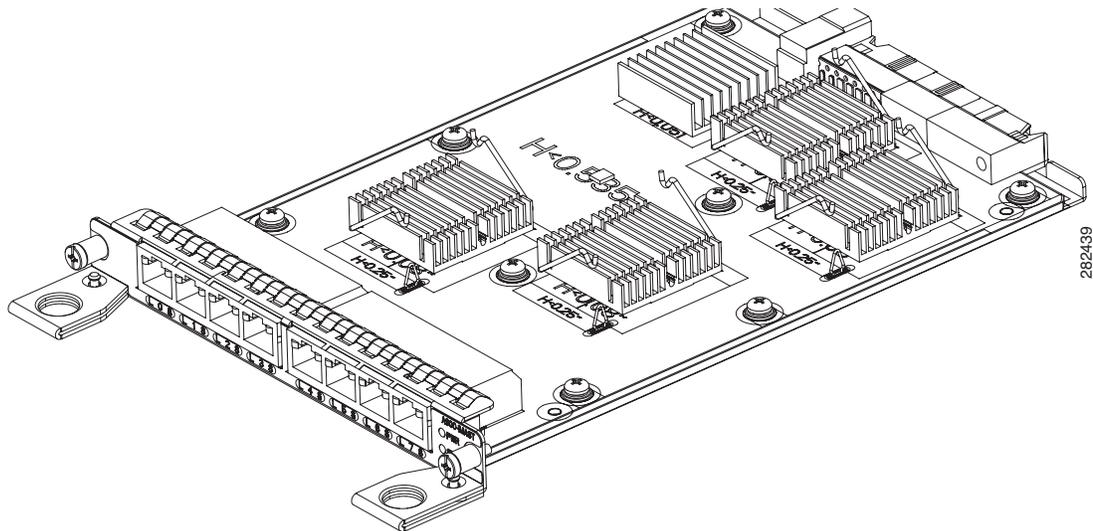
For more information about installing an RJ45 Gigabit Ethernet module, see the "Interface Module Installation" section on page 3-14.

10 Gigabit Ethernet XFP Interface Module

The 10 Gigabit Ethernet XFP interface module provides a single port supporting a 10 Gigabit Ethernet XFP module. Figure 1-6 shows the interface module.

Figure 1-6   *1 x 10 GE Gigabit Ethernet XFP Interface Module*
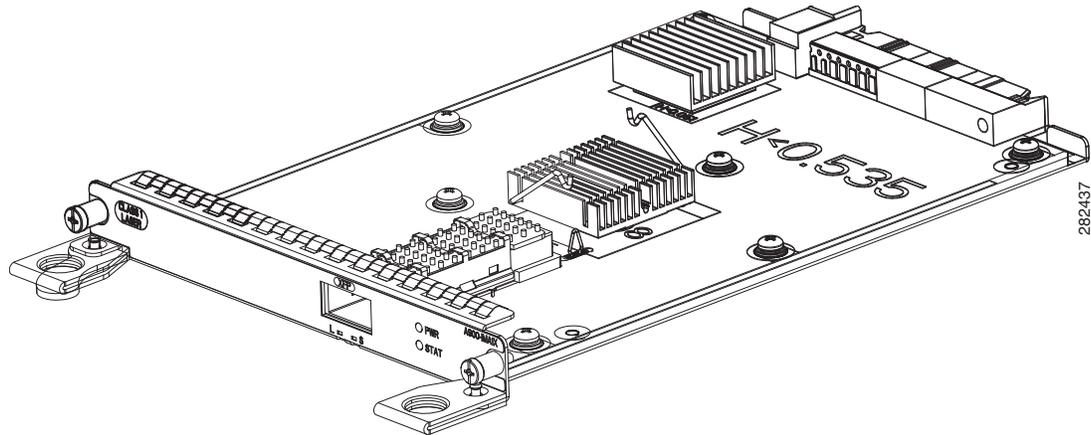
Note   10 Gigabit Ethernet interface modules are not supported in slots 4 and 5.

Supported SFP Modules

The 10 Gigabit Ethernet SFP interface module supports the following SFP modules:

- DWDM-XFP-30.33
- DWDM-XFP-31.12
- DWDM-XFP-31.90
- DWDM-XFP-32.68
- DWDM-XFP-34.25
- DWDM-XFP-35.04
- DWDM-XFP-35.82
- DWDM-XFP-36.61
- DWDM-XFP-38.19
- DWDM-XFP-38.98v
- DWDM-XFP-39.77
- DWDM-XFP-40.56
- DWDM-XFP-42.14
- DWDM-XFP-42.94
- DWDM-XFP-43.73
- DWDM-XFP-44.53
- DWDM-XFP-46.12

- DWDM-XFP-46.92
- DWDM-XFP-47.72
- DWDM-XFP-48.51
- DWDM-XFP-50.12
- DWDM-XFP-50.92
- DWDM-XFP-51.72v
- DWDM-XFP-52.52
- DWDM-XFP-54.13
- DWDM-XFP-54.94
- DWDM-XFP-55.75
- DWDM-XFP-56.55
- DWDM-XFP-58.17
- DWDM-XFP-58.98
- DWDM-XFP-59.79
- DWDM-XFP-60.61
- DWDM-XFP-1560.61
- DWDM-XFP-C
- ONS-XC-10G-EP
- XFP10GER-192IR-L
- XFP-10GER-OC192IR
- XFP-10GER-OC192IR-RGD
- XFP10GLR-192SR-L
- XFP-10GLR-OC192SR
- XFP-10GLR-OC192SR-RGD
- XFP-10G-MM-SR
- XFP-10GZR-OC192LR
- XFP-10GZR-OC192LR-RGD

For more information about installing a 10GE XFP module, see the .

T1/E1 Interface Module

The T1/E1 interface module provides connectivity for up to 16 T1/E1 ports through a 100-pin Amplimite connector. The T1/E1 interface module requires the use of a patch panel to provide RJ48 (T1) or BNC (E1) connectors. Figure 1-7 shows the interface module.

Figure 1-7   16 x T1/E1 Interface Module
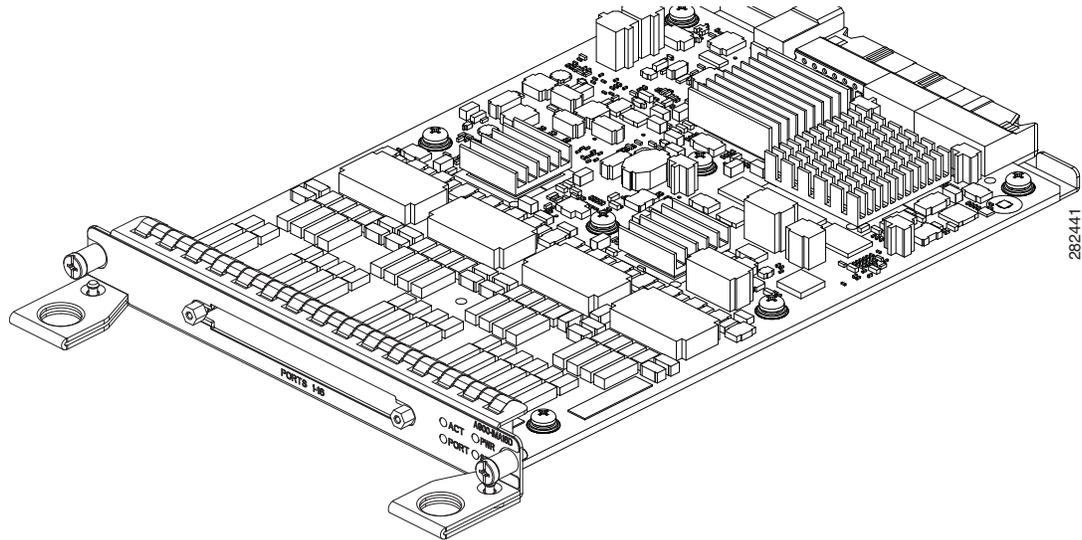
For more information about installing a T1/E1 interface module, see the "Interface Module Installation" section on page 3-14.

OC-3 Interface Module

The OC-3 interface module can operate as up to four STM-1 interfaces.

Note The optical interface module is designed for OC-3 and OC-12 traffic, but OC-12 functionality is not currently supported.

Figure 1-8 shows the interface module.

Figure 1-8   4 x OC-3 Interface Module
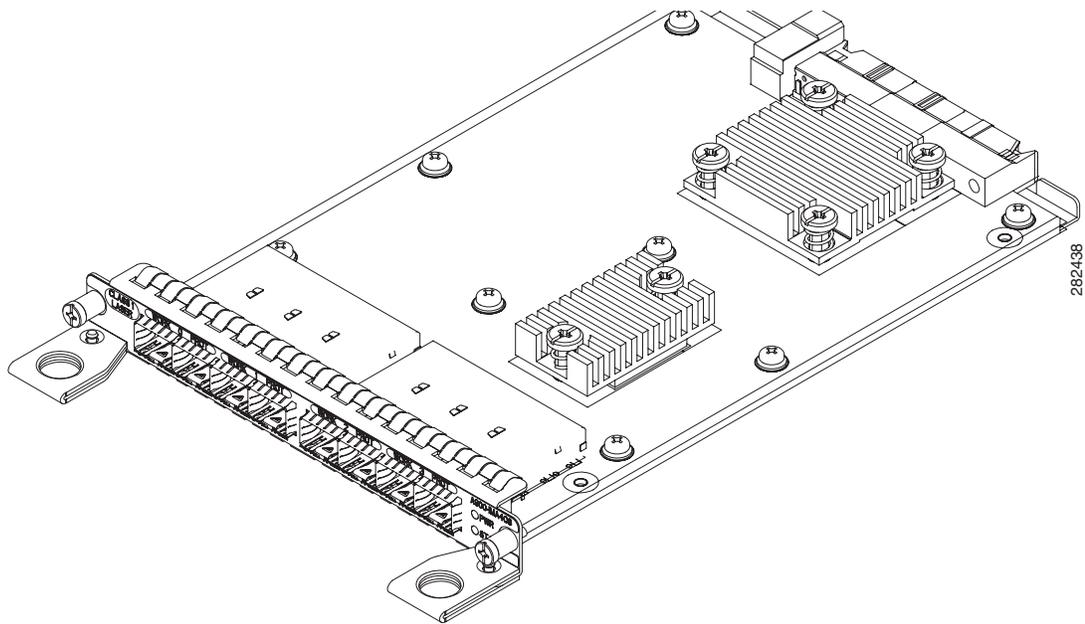
Supported SFP Modules

The optical interface module supports the following optical transceivers:

- ONS-SC-155-EL
- ONS-SI-155-I1
- ONS-SI-155-L1
- ONS-SI-155-L2
- ONS-SI-155-SR-MM

For more information about installing an optical interface module, see the "Interface Module Installation" section on page 3-14.

Temperature Sensor

The Cisco ASR 903 Router has a temperature sensor to detect overtemperature conditions inside the chassis. The overtemperature detection trips at 75 degrees C +/- 5% with the ambient (inlet) trip point at 67 degrees C. This condition is reported to the processor as an interrupt, and the software takes action to generate the appropriate alarms.

Serial Number Label Location

Figure 1-9 shows the serial number label location on the Cisco ASR 903 Router.

Figure 1-9   *Cisco ASR 903 Router Serial Number Location*
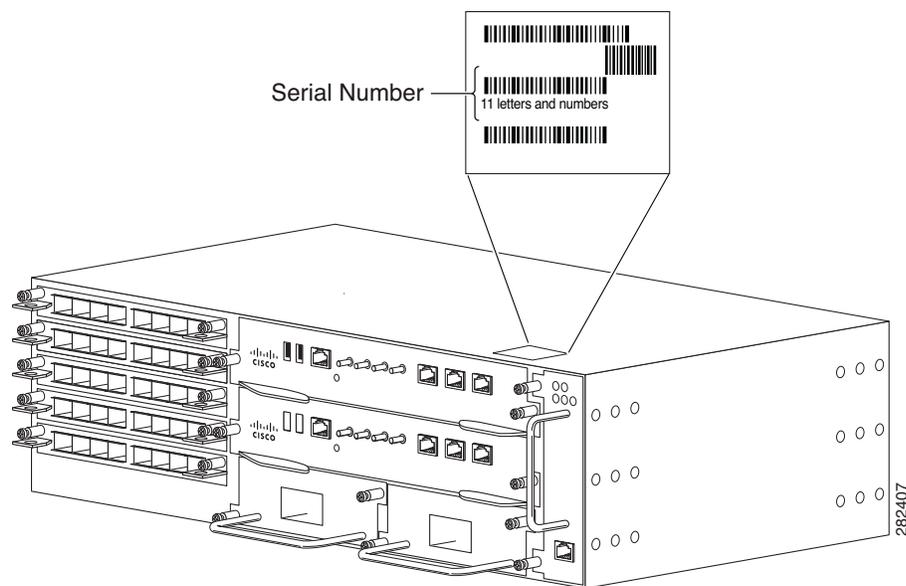
Interface Numbering

The Cisco ASR 903 Router chassis includes:

- Six interface module slots
- Two RSP module slots
- Two power supply slots
- One fan tray slot

Each network interface on a Cisco ASR 903 Router is identified by a slot number and a port number.

Figure 1-10 shows interface numbering in a Cisco ASR 903 Router.

Figure 1-10   ***Cisco ASR 903 Router Slot Numbers***
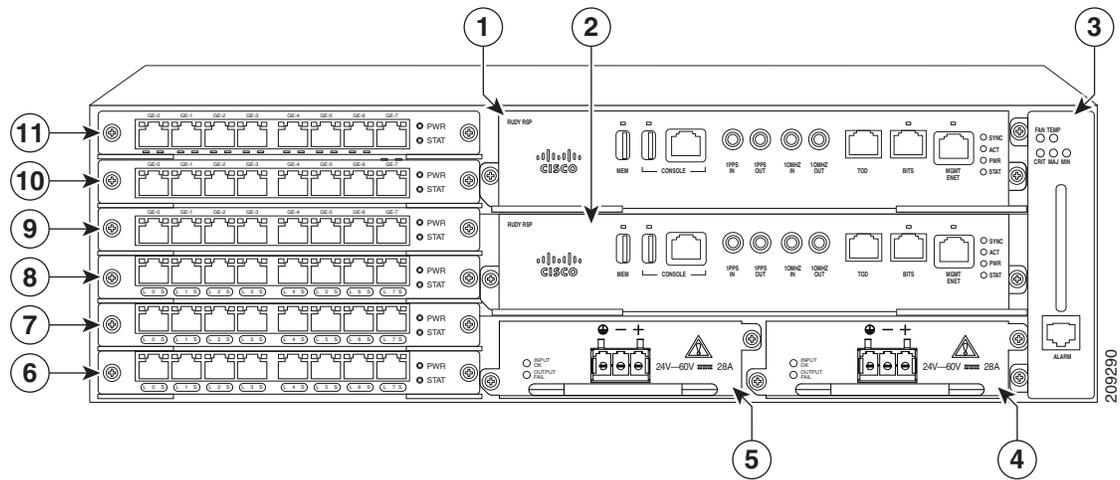
1	RSP slot 1
2	RSP slot 0
3	Fan tray slot
4	Power supply slot 1
5	Power supply slot 0
6	Interface module slot 0
7	Interface module slot 1
8	Interface module slot 2
9	Interface module slot 3
10	Interface module slot 4
11	Interface module slot 5

Following is an explanation of the slot or port numbering:

- The numbering format is Interface type slot or interface number. Interface (port) numbers begin at logical 0 for each interface type.

- Interface module slots are numbered from bottom to top, with logical interfaces on each module numbered from left to right. Interfaces are hard-wired. Therefore, port 0 is always logical interface 0/0, port 1 is always logical interface 0/1, and so on.

Regulatory Compliance

For regulatory compliance and safety information, see the *Regulatory Compliance and Safety Information for the Cisco ASR 903 Router* document.

Preparing for Installation

The following sections describe how to prepare for the installation of the Cisco ASR 903 Router at your site:

- Safety Guidelines, page 2-1
- Site Planning, page 2-9
- Receiving the Cisco ASR 903 Router, page 2-19

Safety Guidelines

Before you begin the installation of the Cisco ASR 903 Router, review the safety guidelines in this chapter to avoid injuring yourself or damaging the equipment.

In addition, before replacing, configuring, or maintaining the Cisco ASR 903 Router, review the safety warnings listed in *Regulatory Compliance and Safety Information for the Cisco ASR 903 Router*.

The following sections describe the safety guidelines for the Cisco ASR 903 Router:

- Standard Warning Statements, page 2-2
- Safety Guidelines for Personal Safety and Equipment Protection, page 2-3
- Safety Precautions for Module Installation and Removal, page 2-3
- Safety with Electricity, page 2-4
- Power Supply Considerations, page 2-8
- Preventing ESD Damage, page 2-8

Standard Warning Statements

To see translations of the warnings that appear in this publication, refer to the Regulatory Compliance and Safety Information document that accompanied this device.

Warning   **To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety: This unit should be mounted at the bottom of the rack if it is the only unit in the rack. When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack. If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.** Statement 1006

Warning   **This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security.** Statement 1017

Warning   **Ultimate disposal of this product should be handled according to all national laws and regulations.** Statement 1040

Warning   **To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 149°F (65°C).** Statement 1047

Warning   **The chassis should be mounted on a rack that is permanently affixed to the building.** Statement 1049

Warning   **IMPORTANT SAFETY INSTRUCTIONS: This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device.** Statement 1071

Warning   **This is a Class A Device and is registered for EMC requirements for industrial use. The seller or buyer should be aware of this. If this type was sold or purchased by mistake, it should be replaced with a residential-use type.** Statement 294

Warning   **This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.** Statement 340

Warning   **This equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.**

Safety Guidelines for Personal Safety and Equipment Protection

The following guidelines help ensure your safety and protect the equipment. This list does not include all the potentially hazardous situations. Therefore, you should be on alert.

- Before moving the system, always disconnect all the power cords and interface cables.
- Never assume that power is disconnected from a circuit; *always* check.
- Before and after installation, keep the chassis area clear and dust-free.
- Keep tools and assembly components away from walk areas where you or others could trip over them.
- Do not work alone if potentially hazardous conditions exist.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.
- Do not wear loose clothing that may get caught in the chassis.
- When working under conditions that may be hazardous to your eyes, wear safety glasses.

Safety Precautions for Module Installation and Removal

Be sure to observe the following safety precautions when you work on the router.

To see translations of the warnings that appear in this publication, refer to the Regulatory Compliance and Safety Information document that accompanied this device.

Warning **Class 1 laser product.** Statement 1008

Warning **Do not stare into the beam or view it directly with optical instruments.** Statement 1011

Warning **Invisible laser radiation present.** Statement 1016

Warning **Hazardous network voltages are present in WAN ports regardless of whether power to the unit is OFF or ON. To avoid electric shock, use caution when working near WAN ports. When detaching cables, detach the end away from the unit first.** Statement 1026

Warning **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 1029

Warning **Hazardous voltage or energy is present on the backplane when the system is operating. Use caution when servicing.** Statement 1034

Warning   **Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.** Statement 1051

Safety with Electricity

Warning   **Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units.** Statement 12

Warning   **Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals.** Statement 43

Warning   **Do not work on the system or connect or disconnect cables during periods of lightning activity.** Statement 1001

Warning   **Before performing any of the following procedures, ensure that power is removed from the DC circuit.** Statement 1003

Warning   **Read the installation instructions before connecting the system to the power source.** Statement 1004

Warning   **This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated: For a -48/-60 VDC installation, the wire shall be 12 AWG minimum with a 20 A branch circuit breaker. For a 24 VDC installation, the wire shall be 8 AWG minimum with a 40 A branch circuit breaker.** Statement 1005

Warning   **This product relies on the building's installation for short-circuit (overcurrent) protection. For an AC installation, ensure that the branch circuit breaker is rated a maximum 20A.**

Warning   **There is the danger of explosion if the battery is replaced incorrectly. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.** Statement 1015

Warning   **This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security.** Statement 1017

Warning   **When you connect or disconnect the power and relay connector with power applied, an electrical arc can occur. This could cause an explosion in hazardous area installations. Be sure that power is removed from the switch and alarm circuit. Be sure that power cannot be accidentally turned on or verify that the area is nonhazardous before proceeding. Failure to securely tighten the power and relay connector captive screws can result in an electrical arc if the connector is accidentally removed.** Statement 1058

Warning   **Take care when connecting units to the supply circuit so that wiring is not overloaded.** Statement 1018

Warning   **The plug-socket combination must be accessible at all times, because it serves as the main disconnecting device.** Statement 1019

Warning   **To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. LAN ports contain SELV circuits, and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ45 connectors. Use caution when connecting cables.** Statement 1021

Warning   **A readily accessible two-poled disconnect device must be incorporated in the fixed wiring.** Statement 1022

Warning   **To reduce the risk of fire, use only 26 AWG or larger telecommunication line cord.** Statement 1023

Warning   **This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.** Statement 1024

Warning   **Use copper conductors only.** Statement 1025

Warning   **This unit might have more than one power supply connection. All connections must be removed to de-energize the unit.** Statement 1028

Warning   **To prevent personal injury or damage to the chassis, never attempt to lift or tilt the chassis using the handles on modules (such as power supplies, fans, or cards); these types of handles are not designed to support the weight of the unit.** Statement 1032

Warning   **Connect the unit only to DC power source that complies with the safety extra-low voltage (SELV) requirements in IEC 60950 based safety standards.** Statement 1033

Cisco ASR 903 Router Hardware Installation Guide

Warning   **Do not use this product near water; for example, near a bath tub, wash bowl, kitchen sink or laundry tub, in a wet basement, or near a swimming pool.** Statement 1035

Warning   **Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.** Statement 1036

Warning   **Before opening the unit, disconnect the telephone-network cables to avoid contact with telephone-network voltages.** Statement 1041

Warning   **This equipment must be installed and maintained by service personnel as defined by AS/NZS 3260. Incorrectly connecting this equipment to a general-purpose outlet could be hazardous. The telecommunications lines must be disconnected 1) before unplugging the main power connector or 2) while the housing is open, or both.** Statement 1043

Warning   **This product requires short-circuit (overturned) protection, to be provided as part of the building installation. Install only in accordance with national and local wiring regulations.** Statement 1045

Warning   **When installing or replacing the unit, the ground connection must always be made first and disconnected last.** Statement 1046

Warning   **Never install an AC power module and a DC power module in the same chassis.** Statement 1050

Warning   **Failure to securely tighten the power and relay connector captive screws can result in an electrical arc if the connector is accidentally removed.** Statement 1058

Warning   **This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use.**

Warning   **If you connect or disconnect the console cable with power applied to the switch or any device on the network, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding. To verify switch operation, perform POST on the switch in a nonhazardous location before installation.** Statement 1065

Warning   **Installation of the equipment must comply with local and national electrical codes.** Statement 1074

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Warning   **Hazardous voltage or energy may be present on DC power terminals. Always replace cover when terminals are not in service. Be sure uninsulated conductors are not accessible when cover is in place.** Statement 1075

When working on equipment powered by electricity, follow these guidelines:

*   Locate the room's emergency power-off switch. If an electrical accident occurs, you will be able to quickly turn off the power.

*   Before working on the system, turn off the DC main circuit breaker and disconnect the power terminal block cable.

*   Before doing the following, disconnect all power:

    –   Working on or near power supplies

    –   Installing or removing a router chassis or network processor module

    –   Performing most hardware upgrades

*   Never install equipment that appears damaged.

*   Carefully examine your work area for possible hazards, such as moist floors, ungrounded power extension cables, and missing safety grounds.

*   Never assume that power is disconnected from a circuit; *always* check.

*   Never perform any action that creates a potential hazard to people or makes the equipment unsafe.

*   If an electrical accident occurs, proceed as follows:

    –   Use caution, and do not become a victim yourself.

    –   Turn off power to the router.

    –   If possible, send another person to get medical aid. Otherwise, determine the condition of the victim, and then call for help.

    –   Determine whether the person needs rescue breathing or external cardiac compressions; then take appropriate action.

In addition, use the following guidelines when working with any equipment that is disconnected from a power source, but still connected to telephone wiring or network cabling:

*   Never install telephone wiring during a lightning storm.

*   Never install telephone jacks in wet locations unless the jack is specifically designed for it.

*   Never touch uninsulated telephone wires or terminals unless the telephone line is disconnected at the network interface.

*   When installing or modifying telephone lines, use caution.

Power Supply Considerations

Check the power at your site to ensure that you are receiving clean power (free of spikes and noise). Install a power conditioner if necessary.

Warning   **This equipment is designed for connection to TN and IT power systems.** Statement 16

Preventing ESD Damage

Warning   **This equipment needs to be grounded. Use a green and yellow 6 AWG ground wire to connect the host to earth ground during normal use.** Statement 383

Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry. ESD can occur when electronic printed circuit cards are improperly handled and can cause complete or intermittent failures. When removing and replacing modules, always follow ESD prevention procedures:

*   Ensure that the router chassis is electrically connected to earth ground.

*   Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. To channel unwanted ESD voltages safely to ground, connect the clip to an unpainted surface of the chassis frame. To guard against ESD damage and shocks, the wrist strap and cord must operate effectively.

*   If no wrist strap is available, ground yourself by touching a metal part of the chassis.

*   When installing a component, use any available ejector levers or captive installation screws to properly seat the bus connectors in the backplane or midplane. These devices prevent accidental removal, provide proper grounding for the system, and help to ensure that bus connectors are properly seated.

*   When removing a component, use available ejector levers or captive installation screws, if any, to release the bus connectors from the backplane or midplane.

*   Handle components by their handles or edges only; do not touch the printed circuit boards or connectors.

*   Place a removed component board side up on an antistatic surface or in a static-shielding container. If you plan to return the component to the factory, immediately place it in a static-shielding container.

*   Avoid contact between the printed circuit boards and clothing. The wrist strap only protects components from ESD voltages on the body; ESD voltages on clothing can still cause damage.

*   Never attempt to remove the printed circuit board from the metal carrier.

Note   For the safety of your equipment, periodically check the resistance value of the antistatic wrist strap. It should be between 1 and 10 Mohm.

Site Planning

The following sections describe how to plan for the installation of the Cisco ASR 903 Router:

General Precautions

Observe the following general precautions when using and working with your Cisco ASR 903 Router system:

- Keep your system components away from radiators and heat sources and do not block cooling vents.
- Do not spill food or liquids on your system components and never operate the product in a wet environment.
- Do not push any objects into the openings of your system components. Doing so can cause fire or electric shock by shorting out interior components.
- Position system cables and power supply cables carefully. Route system cables and the power supply cable and plug so that they cannot be stepped on or tripped over. Be sure that nothing else rests on your system component cables or power cable.
- Do not modify power cables or plugs. Consult a licensed electrician or your power company for site modifications. Always follow your local and national wiring rules.
- If you turn off your system, wait at least 30 seconds before turning it on again to avoid system component damage.

Site Planning Checklist

Use the following checklist to perform and account for all the site planning tasks described in this chapter:

- The site meets the environmental requirements.
- The site's air conditioning system can compensate for the heat dissipation of the Cisco ASR 903 Router.
- The floor space that the Cisco ASR 903 Router occupies can support the weight of the system.
- Electrical service to the site complies with the requirements.
- The electrical circuit servicing the Cisco ASR 903 Router complies with the requirements.

- Consideration has been given to the console port wiring and limitations of the cabling involved, according to TIA/EIA-232F.

- The Cisco ASR 903 Router Ethernet cabling distances are within limitations.

- The equipment rack in which you plan to install the Cisco ASR 903 Router complies with requirements.

- In selecting the location of the rack, careful consideration has been given to safety, ease of maintenance, and proper airflow.

Site Selection Guidelines

The Cisco ASR 903 Router requires specific environmental operating conditions. Temperature, humidity, altitude, and vibration can affect the performance and reliability of the router. The following sections provide specific information to help you plan for the proper operating environment.

The Cisco ASR 903 Router is designed to meet the industry EMC, safety, and environmental standards described in the *Regulatory, Safety, and Compliance Information for the Cisco ASR 903 Router.*

Environmental Requirements

Environmental monitoring in the Cisco ASR 903 Router protects the system and components from damage caused by excessive voltage and temperature conditions. To ensure normal operation and avoid unnecessary maintenance, plan and prepare your site configuration *before* installation. After installation, make sure that the site maintains the environmental characteristics described in "System Specifications" section on page 2.

Physical Characteristics

Be familiar with the physical characteristics of the Cisco ASR 903 Router to assist you in placing the system in the proper location. For more information, see the "System Specifications" section on page 2.

Air Flow Guidelines

Cool air is circulated through the Cisco ASR 903 Router by a fan tray located along the right side of the router. Air flow is side-to-side, right to left, as shown in "Cisco ASR 903 Router Chassis Air Flow".

Figure 2-1   *Cisco ASR 903 Router Chassis Air Flow*
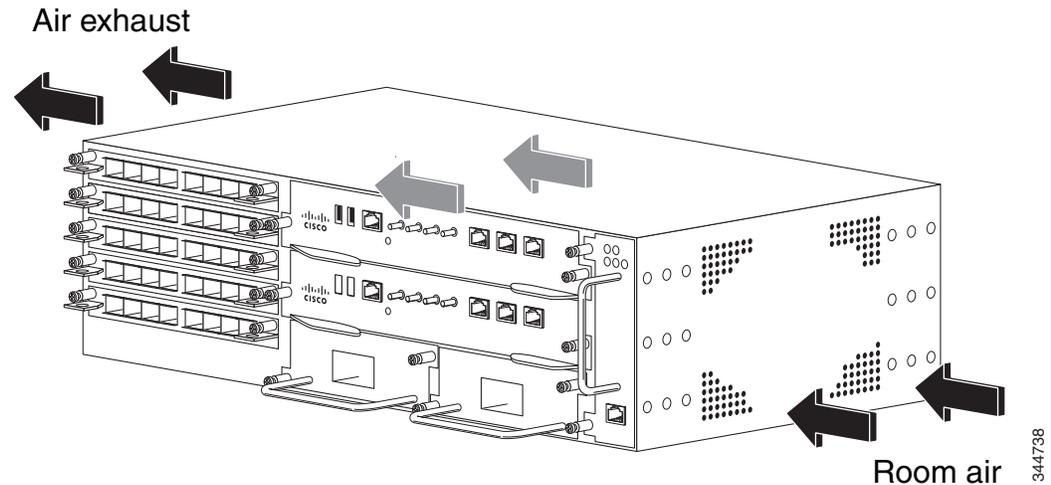
The fan trays maintain acceptable operating temperatures for the internal components by drawing in cool air through the vents, and circulating the air through the chassis.

The following guidelines will help you plan your equipment rack configuration:

- To ensure adequate air flow through the equipment rack, we recommend that you maintain a clearance of at least 80 mm on each side of the rack at all times.

- If airflow through the equipment rack and the routers that occupy it is blocked or restricted, or if the ambient air being drawn into the rack is too warm, an overtemperature condition can occur within the rack and the routers that occupy it.

- The site should also be as dust-free as possible. Dust tends to clog the router fans, reducing the flow of cooling air through the equipment rack and the routers that occupy it, thus increasing the risk of an overtemperature condition.

- Enclosed racks must have adequate ventilation. Ensure that the rack is not congested, because each router generates heat. An enclosed rack should have louvered sides and a fan to provide cooling air. Heat that is generated by the equipment near the bottom of the rack can be drawn upward into the intake ports of the equipment above.

- When mounting a chassis in an open rack, ensure that the rack frame does not block the side intakes and the exhaust fans.

- When rack-installed equipment fails, especially equipment in an enclosed rack, try operating the equipment by itself, if possible. Power off all other equipment in the rack (and in adjacent racks) to give the router maximum cooling air and clean power.

- Avoid locating the Cisco ASR 903 Router in a location in which the chassis air intake vents may draw in the exhaust air from adjacent equipment. Consider how the air flows through the router; the airflow direction is side to side, with ambient air drawn in from the vents located on the front right of the chassis.

Air Flow Guidelines for Enclosed Rack Installation

To install a Cisco ASR 903 Router in a 4-post enclosed cabinet, the front and rear doors of the cabinet must be removed or be perforated with a minimum of 65% open area (70% for ETSI 800mm racks).

If you are mounting the chassis in a 4-post enclosed cabinet, ensure that you have a minimum of 6 inches (15.24 cm) of clearance on each side of the chassis.

Floor Loading Considerations

Ensure that the floor under the rack supporting the Cisco ASR 903 Routers is capable of supporting the combined weight of the rack and all the other installed equipment.

To assess the weight of a fully configured Cisco ASR 903 Router, refer to "System Specifications" section on page 1-2.

For additional information about floor loading requirements, consult *GR-63-CORE, Network Equipment Building System (NEBS) Requirements: Physical Protection*.

Site Power Guidelines

The Cisco ASR 903 Router has specific power and electrical wiring requirements. Adhering to these requirements ensures reliable operation of the system. Follow these precautions and recommendations when planning your site power for the Cisco ASR 903 Router:

- The redundant power option provides a second, identical power supply to ensure that power to the chassis continues uninterrupted if one power supply fails or input power on one line fails.

- In systems configured with the redundant power option, connect each of the two power supplies to a separate input power source. If you fail to do this, your system might be susceptible to total power failure due to a fault in the external wiring or a tripped circuit breaker.

- To prevent a loss of input power, be sure that the total maximum load on each circuit supplying the power supplies is within the current ratings of the wiring and the breakers.

- Check the power at your site before installation and periodically after installation to ensure that you are receiving clean power. Install a power conditioner if necessary.

- Provide proper grounding to avoid personal injury and damage to the equipment due to lightning striking power lines or due to power surges. The chassis ground must be attached to a central office or other interior ground system.

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Caution   This product requires short-circuit (overcurrent) protection, to be provided as part of the building installation. Install only in accordance with national and local wiring regulations.

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Note   The Cisco ASR 903 Router installation must comply with all the applicable codes and is approved for use with copper conductors only. The ground bond fastening hardware should be of compatible material and preclude loosening, deterioration, and electrochemical corrosion of hardware and joined material. Attachment of the chassis ground to a central office or other interior ground system must be made with a 6 AWG gauge wire, copper ground conductor at a minimum.

The maximum power draw of the Cisco ASR 903 Router chassis and its configurable hardware components are listed in the following table. The maximum power draw values are not affected by whether the router chassis contains 1 or 2 power supplies AC or DC.

Hardware component(s)	Maximum power draw value
Router chassis with 2 power supplies, 1 fan tray, and 1 RSP1A	195 W
Router chassis with 2 power supplies, 1 fan tray, and 1 RSP1B	210 W
A900-RSP1A-55 (standby)	100 W
A900-RSP1B-55 (standby)	100 W
A900-IMA1X (1-port 10 GE XFP interface module)	13.0 W
A900-IMA8T (8-port 1 GE RJ45 interface module)	17.5 W
A900-IMA8S (8-port 1 GE SFP interface module)	17.5 W
A900-IMA16D (16-port T1/E1 interface module)	14.5 W
A900-IMA4OS (4-Port OC3 interface Module)	26 W

Electrical Circuit Requirements

Each Cisco ASR 903 Router requires a dedicated electrical circuit. If you equip it with dual power feeds, provide a separate circuit for each power supply to avoid compromising the power redundancy feature.

The Cisco ASR 903 Routers can be powered by a DC source or an AC source. Ensure that equipment grounding is present and observe the power strip ratings. Make sure that the total ampere rating of all products plugged into the power strip does not exceed 80% of the rating.

For more information about the Cisco ASR 903 Router power supply, see the "Power Supply Features" section on page 1-3.

Site Cabling Guidelines

This section contains guidelines for wiring and cabling at your site. When preparing your site for network connections to the Cisco ASR 903 Router, consider the type of cable required for each component, and the cable limitations. Consider the distance limitations for signaling, electromagnetic interference (EMI), and connector compatibility. Possible cable types are fiber, thick or thin coaxial, foil twisted-pair, or unshielded twisted-pair cabling.

Also consider any additional interface equipment you need, such as transceivers, hubs, switches, modems, channel service units (CSU), or data service units (DSU).

Before you begin, read these important notes about cabling:

- The T1/E1 interface module for the Cisco ASR 903 Router uses a high-density connector that requires the use of a T1/E1 interface cable and a customer-provided patch panel. For more information, see "Connecting T1/E1 cables" section on page 3-40.

- Shielded cables must be used to connect to the DB-25 alarm connector on the fan tray in order to comply with FCC/EN55022/CISPR22 Class A emissions requirements. For information about the fan tray alarm port, see "Connecting the Fan Tray Alarm Port" section on page 3-42.

Before you install the Cisco ASR 903 Router, have all the additional external equipment and cables on hand. For information about ordering, contact a Cisco customer service representative.

The extent of your network and the distances between the network interface connections depend in part on the following factors:

- Signal type

- Signal speed

- Transmission medium

The distance and rate limits referenced in the following sections are the IEEE-recommended maximum speeds and distances for signaling purposes. Use this information as a guideline in planning your network connections prior to installing the Cisco ASR 903 Router.

If wires exceed the recommended distances, or if wires pass between buildings, give special consideration to the effect of a lightning strike in your vicinity. The electromagnetic pulse caused by lightning or other high-energy phenomena can easily couple enough energy into unshielded conductors to destroy electronic devices. If you have had problems of this sort in the past, you may want to consult experts in electrical surge suppression and shielding.

Asynchronous Terminal Connections

The RSP provides a console port to connect a terminal or computer for local console access. The port has an RJ45 connector and supports RS-232 asynchronous data with distance recommendations specified in the IEEE RS-232 standard.

Interference Considerations

When wires are run for any significant distance, there is a risk that stray signals will be induced on the wires as interference. If interference signals are strong, they can cause data errors or damage to the equipment.

The following sections describe sources of interference and how to minimize its effects on the Cisco ASR 903 Router system.

Electromagnetic Interference

All equipment powered by AC current can propagate electrical energy that can cause EMI and possibly affect the operation of other equipment. The typical sources of EMI are equipment power cords and power service cables from electric utility companies.

Strong EMI can destroy the signal drivers and receivers in the Cisco ASR 903 Router and even create an electrical hazard by causing power surges through the power lines into installed equipment. These problems are rare but could be catastrophic.

To resolve these problems, you need specialized knowledge and equipment that could consume substantial time and money. However, you can ensure that you have a properly grounded and shielded electrical environment, paying special attention to the need for electrical surge suppression.

For information about the electrode magnetic compliance standards supported on the Cisco ASR 903 Router, see *Regulatory Compliance and Safety Information for the Cisco ASR 903 Router*.

Radio Frequency Interference

When electromagnetic fields act over a long distance, radio frequency interference (RFI) may be propagated. Building wiring can often act as an antenna, receiving the RFI signals and creating more EMI on the wiring.

If you use twisted-pair cable in your plant wiring with a good distribution of grounding conductors, the plant wiring is unlikely to emit radio interference. If you exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal.

Lightning and AC Power Fault Interference

If signal wires exceed the recommended cabling distances, or if signal wires pass between buildings, you should consider the effect that a lightning strike in your vicinity might have on the Cisco ASR 903 Router.

The electromagnetic pulse (EMP) generated by lightning or other high-energy phenomena can couple enough energy into unshielded conductors to damage or destroy electronic equipment. If you have previously experienced such problems, you should consult with RFI and EMI experts to ensure that you have adequate electrical surge suppression and shielding of signal cables in your Cisco ASR 903 Router operating environment.

Rack-Mounting Guidelines

The following sections provide guidelines for rack-mounting the Cisco ASR 903 Router:

- Precautions for Rack-Mounting, page 2-15
- Rack Selection Guidelines, page 2-15
- Equipment Rack Guidelines, page 2-16

Precautions for Rack-Mounting

The following rack-mount guidelines are provided to ensure your safety:

- Do not move large racks by yourself. Due to the height and weight of a rack, a minimum of two people are required to accomplish this task.
- Ensure that the rack is level and stable before extending a component from the rack.
- Ensure that proper airflow is provided to the components in the rack.
- Do not step on or stand on any component or system when servicing other systems or components in a rack.
- When mounting the Cisco ASR 903 Router in a partially filled rack, load the rack from the bottom to the top, with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

Rack Selection Guidelines

The Cisco ASR 903 Router can be mounted in most two-post or four-post, 19-inch equipment racks that comply with the Electronic Industries Association (EIA) standard for equipment racks (EIA-310-D 19-inch). The rack must have at least two posts with mounting flanges to mount the chassis.

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Caution When mounting a chassis in any type of rack equipment, ensure that the inlet air to the chassis does not exceed 65 degrees C.

The distance between the center lines of the mounting holes on the two mounting posts must be 18.31 inches ± 0.06 inch (46.50 cm ± 0.15 cm). The rack-mounting hardware included with the chassis is suitable for most 19-inch equipment racks.

Consider installing the Cisco ASR 903 Router in a rack with the following features:

- Network Equipment Building System (NEBS) compliant, 19-inch (48.3 cm) wide rack.

- EIA or European Telecommunications Standards Institute (ETSI) hole patterns in the mounting rails. The required mounting hardware is shipped with the Cisco ASR 903 Router. If the rack that you plan to install the system in has metric-threaded rails, you must provide your own metric-mounting hardware.

- Perforated top and open bottom for ventilation to prevent overheating.

- Leveling feet for stability.

Note   The Cisco ASR 903 Router should *not* be installed in an enclosed rack because the chassis requires an unobstructed flow of cooling air to maintain acceptable operating temperatures for its internal components. Installing the router in any type of enclosed rack—*even with the side doors removed*—could disrupt the air flow, trap heat next to the chassis, and cause an overtemperature condition inside the router. If you use an enclosed rack, ensure that there are air vents on all sides of the rack and there is proper ventilation.

Equipment Rack Guidelines

The placement of the rack can affect personnel safety, system maintenance, and the system's ability to operate within the environmental characteristics described in the "System Specifications" section on page 1-2. Choose a proper location for the Cisco ASR 903 Router by following the following guidelines.

Locating for Safety

If the Cisco ASR 903 Router is the heaviest or the only piece of equipment in the rack, consider installing it at or near the bottom to ensure that the rack's center of gravity is as low as possible.

For additional information about the proper placement of electronic equipment, consult the document *GR-63-CORE, Network Equipment Building System (NEBS) Requirements: Physical Protection*.

Locating for Easy Maintenance

Keep at least 3 feet of clear space at the front and back of the rack. This space ensures that you can remove the Cisco ASR 903 Router components and perform routine maintenance and upgrades easily.

Avoid installing the Cisco ASR 903 Router in a congested rack and consider how routing of cables from other pieces of equipment in the same rack could affect access to the router cards.

The sides of the chassis must remain unobstructed to ensure adequate airflow and prevent overheating inside the chassis.

Allow the following clearances for normal system maintenance:

- At the top of the chassis—At least 3 inches (7.6 cm)

- Sides of the chassis—3 to 4 ft (91.44 cm to 121.92 cm)

To avoid problems during installation and ongoing operations, follow these general precautions when you plan equipment locations and connections:

- Use the **show environment all** command regularly to check the internal system status. The environmental monitor continually checks the interior chassis environment; it provides warnings about high temperature and creates reports on other potentially dangerous occurrences. If warning messages are displayed, take immediate action to identify the cause, and correct the problem.

- Keep the Cisco ASR 903 Router off the floor and out of areas that collect dust.

- Follow ESD-prevention procedures to avoid damage to equipment. Damage from static discharge can cause immediate or intermittent equipment failure.

Locating for Proper Airflow

Ensure that the Cisco ASR 903 Router location has enough airflow to keep the system operating within the environmental characteristics and the air temperature is sufficient to compensate for the heat dissipated by the system. For more information, see "Air Flow Guidelines" section on page 2-11.

Installation Checklist

To assist you with your installation and to provide a record of what was done by whom and when, photocopy the Cisco ASR 903 Router Installation Checklist shown in Table 2-1. Use this to record the completion and verification of each procedure. After the checklist is completed, place it in your Site Log along with the other records pertaining to your new Cisco router.

Table 2-1   Cisco ASR 903 Router Installation Checklist

Task	Verified By	Date
Date on which chassis received		
Chassis and all accessories unpacked		
Types and numbers of interfaces verified		
Safety recommendations and guidelines reviewed		
Installation Checklist copied		
Site Log established and background information entered		
Site power voltages verified		
Site environmental specifications verified		
Required passwords, IP addresses, device names, and so on, available		
Required tools available		
Network connection equipment available		
Cable-management brackets installed (optional, but recommended)		
AC power cables connected to AC sources and router		
DC power cables connected to DC sources and router		
Network interface cables and devices connected		
System power turned on		
System boot complete (STATUS LED is on)		
Shared port adapters are operational		
Correct software configuration displayed after system banner appears		

Creating a Site Log

The Site Log provides a record of all the actions related to installing and maintaining the router. Keep it in an accessible place near the chassis so that anyone who performs tasks has access to it.

Create the Site Log prior to the installation. (See Appendix A, "Site Log" for more information on the Site Log as well as a sample Site Log that can be used to make copies.)

Receiving the Cisco ASR 903 Router

Each Cisco ASR 903 Router chassis is shipped in a container that is strapped to a pallet, as illustrated in Figure 2-2.

Figure 2-2   Cisco ASR 903 Router Packaged for Shipping
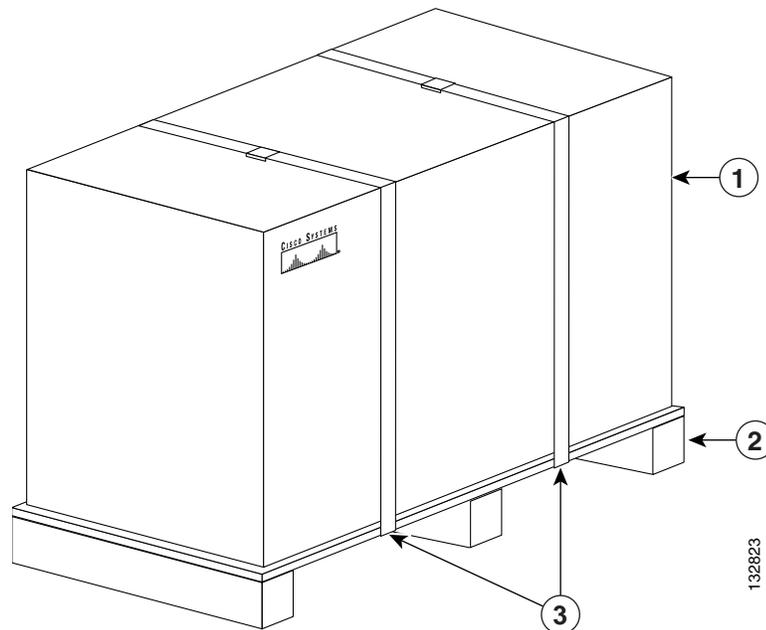
1	Outside carton	3	Packing straps
2	Pallet	—	—

Note   We recommend that you have at least two people available to help with the installation and ensure safe lifting.

Chassis-Lifting Guidelines

The chassis is not intended to be moved frequently. Before you install the system, ensure that your site is properly prepared so that you can avoid having to move the chassis later to accommodate power sources and network connections.

Two or more people are required to lift the chassis. Each time you lift the chassis or any heavy object, follow these guidelines:

- Never attempt to lift the chassis by yourself. Because of the size and weight of the chassis, use at least two people to safely lift and move it without causing injury to yourself or damaging the equipment.

- Ensure that your footing is solid, and balance the weight of the chassis between your feet.

- Lift the chassis slowly; never move suddenly or twist your body as you lift.

- Keep your back straight and lift with your legs, not your back. If you must bend down to lift the chassis, bend at the knees, not at the waist, to reduce the strain on your back muscles.

- Do not remove installed components from the chassis.

- Always disconnect all external cables before lifting or moving the chassis.

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Warning   **To prevent personal injury or damage to the chassis, never attempt to lift or tilt the chassis using the handles on modules (such as power supplies, fans, or cards); these types of handles are not designed to support the weight of the unit. Lift the unit only by using handles that are an integral part of the chassis, or by grasping the chassis underneath its lower edge.** Statement 163

Perform the following to lift a chassis:

Step 1   Each person should stand on either side of the chassis and place one hand under the air intake at the bottom front of the chassis.

Step 2   With the other hand, grasp the top rear of the chassis under the air exhaust, and carefully lift the chassis.

Tools and Equipment

You need the following tools and equipment to install and upgrade the router and its components:

- ESD-preventive cord and wrist strap

- Antistatic mat or antistatic foam

- Number 1 and Number 2 Phillips-head screwdrivers

- Flat-blade screwdrivers: Small 3/16-inch (0.476 cm) and medium 1/4-inch (0.625 cm):

  - To install or remove modules

  - To remove the cover if you are upgrading the memory or other components

- #12-24 pan-head screws to secure the router to the equipment rack

- Cables for connecting to the WAN and LAN ports (depending on the configuration)

Note For more information on cable specifications, see Chapter 5, "Troubleshooting."

- Ethernet hub or switch or PC with a network interface card for connecting to the Ethernet ports
- Console terminal (an ASCII terminal or a PC running terminal emulation software) that is configured for 9600 baud, 8 data bits, no parity, and 2 stop bits
- Console cable for connecting to the console port
- (Optional) Modem for connecting to the auxiliary port for remote administrative access
- Auxiliary cable for connecting to the auxiliary port (you can supply this cable or order one)
- Ratcheting torque screwdriver with a Phillips head that exerts up to 30 pound-force per square inch (in-lb) of pressure
- Crimping tool as specified by the ground lug manufacturer
- 18 AWG copper wire for the power cord
- Wire-stripping tools for stripping both 6 AWG and 18 AWG wire
- Tape measure and level

Warning **Only trained and qualified personnel should be allowed to install or replace this equipment.** Statement 49

Unpacking and Verifying the Shipped Contents

When you receive your chassis, perform the following steps and use the Shipping Contents Checklist:

Step 1 Inspect the box for any shipping damage. If there is obvious physical damage, contact your Cisco service representative.

Step 2 Unpack the Cisco ASR 903 Router.

Step 3 Perform a visual inspection of the chassis.

Step 4 Use Table 2-2 to check the contents of the Cisco ASR 903 Router shipping container. Do not discard the shipping container. You will need the container if you move or ship the Cisco ASR 903 Router in the future.

Table 2-2   Cisco ASR 903 Router Shipping Container Contents

Component	Description
Chassis	Cisco ASR 903 Router chassis
	Fan tray
	Power supplies
	RSP
	Interface modules

Table 2-2   Cisco ASR 903 Router Shipping Container Contents (continued)

Component	Description
Accessories kit	Chassis rack-mount brackets (19-inch EIA)
	Three sets of screws: • Front and rear rack-mount bracket screws (2 sets) • Cable-management bracket screws
	Six cable-management brackets (one per bracket)
	One earth lug with two 10-32 screws.
	1 RJ45 to RJ45 crossover cable 1 RJ45 to DB-9 (female) adapter
ESD, wrist strap (disposable)	One disposable wrist strap (optional)
Documentation	*Regulatory Compliance and Safety Information for the Cisco ASR 903 Router*
Optional equipment	Check the container for the following optional equipment: • Power cord if an AC power supply was shipped. There are no cords for the DC power supply units. • T1/E1 cable connector (required only for T1/E1 interface modules)

Note   Most Cisco documentation is available online. Documentation that is shipped with your Cisco ASR 903 Router includes the *Regulatory Compliance and Safety Information for the Cisco ASR 903 Router* document, and the *Cisco ASR 903 Router Documentation Roadmap* that contains information about the various documents that are available online and the links to them.

CHAPTER **3**

Installing the Cisco ASR 903 Router

This chapter describes how to install the Cisco ASR 903 Router and includes the following sections:

Prerequisites

Before installing the Cisco ASR 903 Router, it is important to prepare for the installation by:

- Preparing the site (site planning) and reviewing the installation plans or method of procedures (MOP)
- Unpacking and inspecting the Cisco ASR 903 Router
- Gathering the tools and test equipment required to properly install the Cisco ASR 903 Router

For more instructions on how to prepare for the installation of the Cisco ASR 903 Router, see Chapter 2, "Preparing for Installation."

Installing the Router in a Rack

The following sections describe how to install the Cisco ASR 903 Router in a rack:

Installing the Chassis Brackets

The chassis is shipped with mounting brackets that can be installed on the front or rear of the chassis. To install the brackets on the front of the chassis, perform these steps:

Step 1   Remove the rack-mount brackets from the accessory kit and position them beside the router chassis.

Figure 3-1 shows how to attach the brackets on the Cisco ASR 903 Router for a 19-inch EIA rack.

Figure 3-1   Attaching Mounting Brackets for a 19-inch EIA Rack
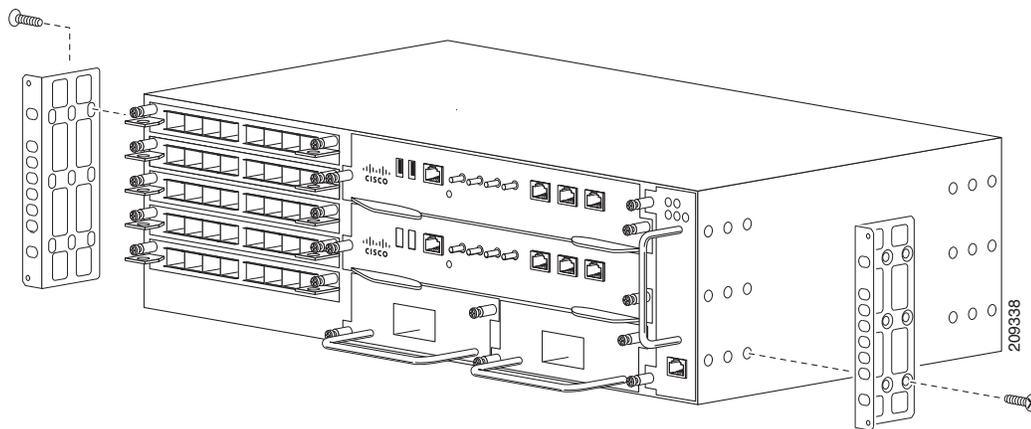
Figure 3-2 shows how to attach the brackets on the Cisco ASR 903 Router for a 300 mm ETSI cabinet.

Figure 3-2   Attaching Mounting Brackets for a 300 mm ETSI Cabinet
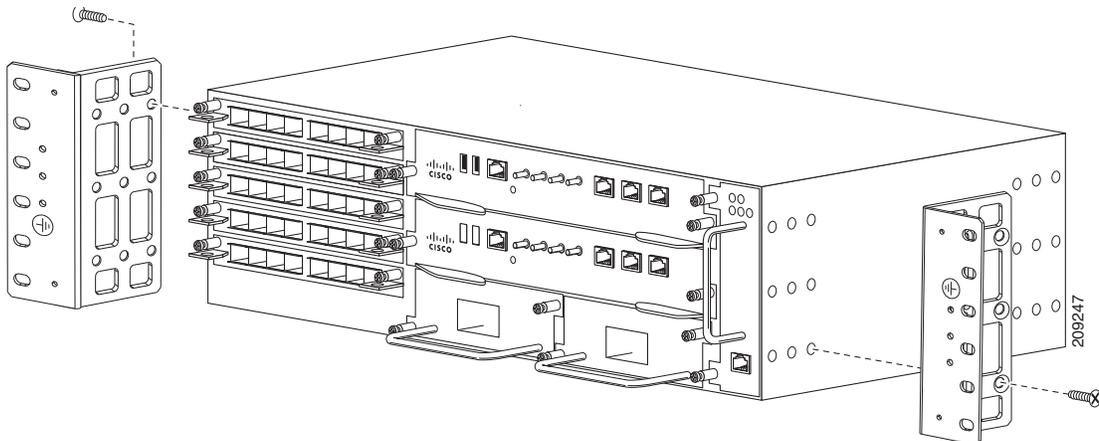
Step 2   Position one of the brackets against the chassis side, and align the screw holes.

Step 3   Secure the bracket to the chassis with the screws removed when performing Step 1. The recommended maximum torque is 28 in.-lb (3.16 N-m).

Step 4   Repeat Step 2 and Step 3 for the other bracket.

Installing the Router Chassis in the Rack

To install the router chassis in the equipment rack, perform these steps:

Step 1   Position the chassis in the rack as follows:

  • If the front of the chassis (front panel) is at the front of the rack, insert the rear of the chassis between the mounting posts.

  • If the rear of the chassis is at the front of the rack, insert the front of the chassis between the mounting posts.

Step 2   Align the mounting holes in the bracket (and optional cable guide) with the mounting holes in the equipment rack.

⚠

Caution   Do not use interface module and power supply ejector handles to lift the chassis; using the handles to lift the chassis can deform or damage the handles.

Figure 3-3   *Installing the Chassis in a 19-inch EIA Rack*
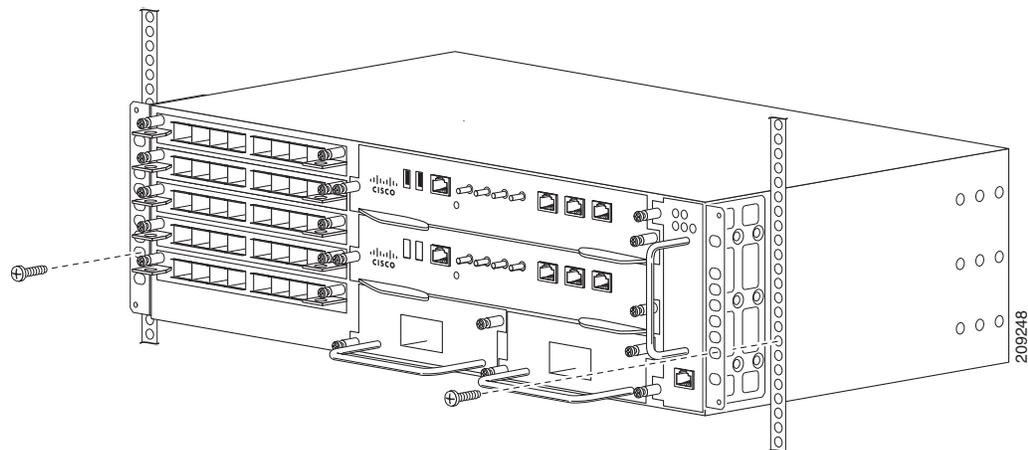
Figure 3-4   *Installing the Chassis to support the Japanese JIS Rack Standard*
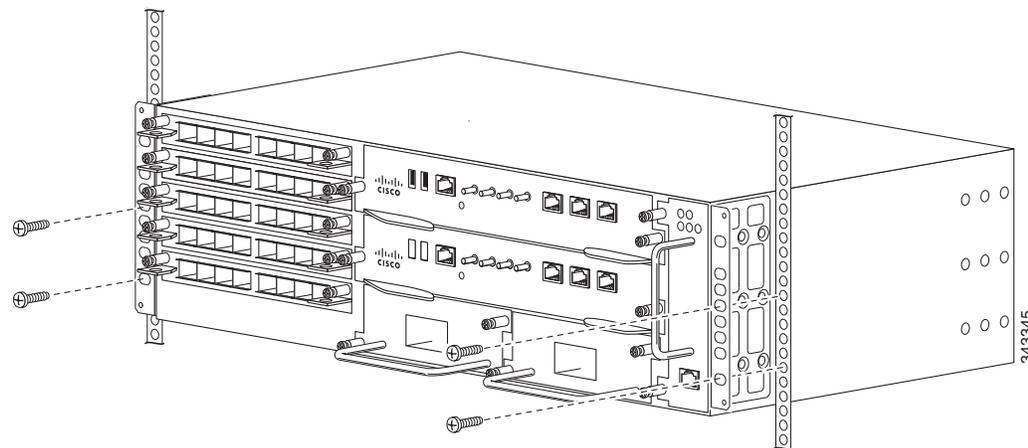
Figure 3-5   Installing the Chassis in a 300 mm ETSI Cabinet
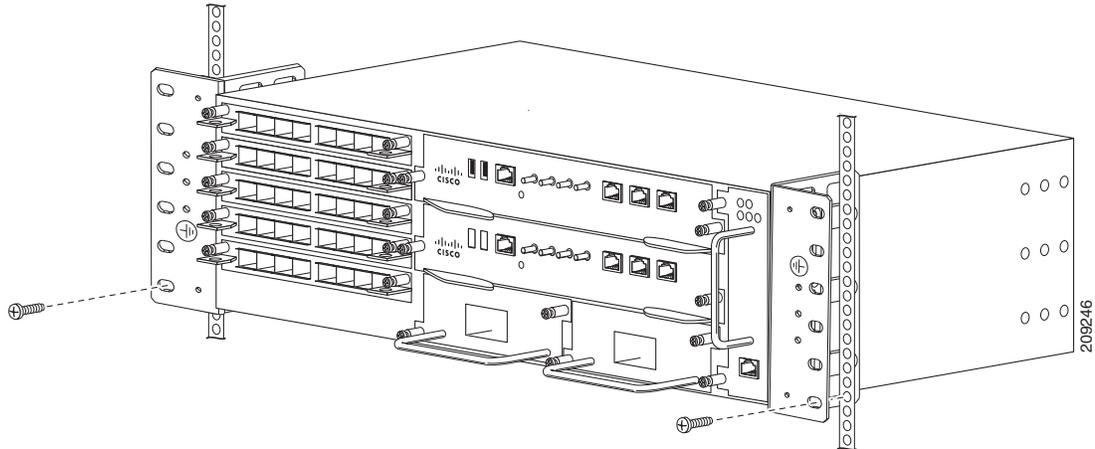
Step 3   Install the 8 or 12 (4 or 6 per side) 12-24 x 3/4-inch or 10-32 x 3/4-inch screws through the holes in the bracket and into the threaded holes in the equipment rack posts.

Step 4   Use a tape measure and level to verify that the chassis is installed straight and level.

Attaching the Cable Management Brackets

To install the optional cable management brackets, perform these steps:

Step 1   Position the cable management brackets against the front of the chassis and align the four screw holes, as shown in Figure 3-6.

Figure 3-6   Cable Management Bracket Installation
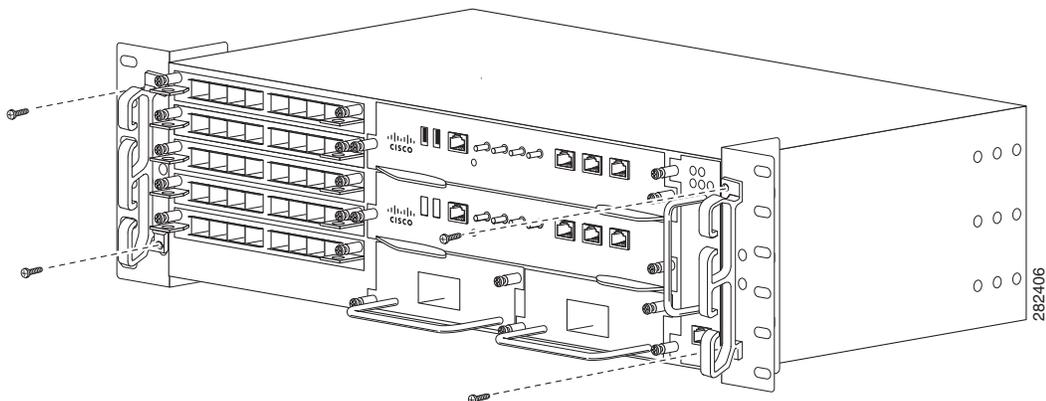
Step 2   Secure the cable management brackets with four M4 screws. The recommended maximum torque is 10 in.-lb (1.12 N-m).

Installing the Chassis Ground Connection

Before you connect the power or turn on the power to the Cisco ASR 903 Router, you must provide an adequate chassis ground (earth) connection to your router.

This section describes how to ground the Cisco ASR 903 Router chassis. The router provides two locations for attaching a 2-hole grounding lug according to the rack-mounting brackets you use to install the router. The Cisco ASR 903 Router supports the following rack-mounting types:

- EIA 19-inch rack—Attach the grounding lug to the rear of the router, as shown in Figure 3-7.

Figure 3-7   *Attaching a Grounding Lug to the Rear of the Router*

1	Grounding lug (19-inch EIA rack)

- 300 mm ETSI cabinet—Attach the grounding lug on the rack-mount bracket on the front of the router, as shown in Figure 3-8.

Figure 3-8   *Attaching a Grounding Lug to the Rack-Mount Bracket*
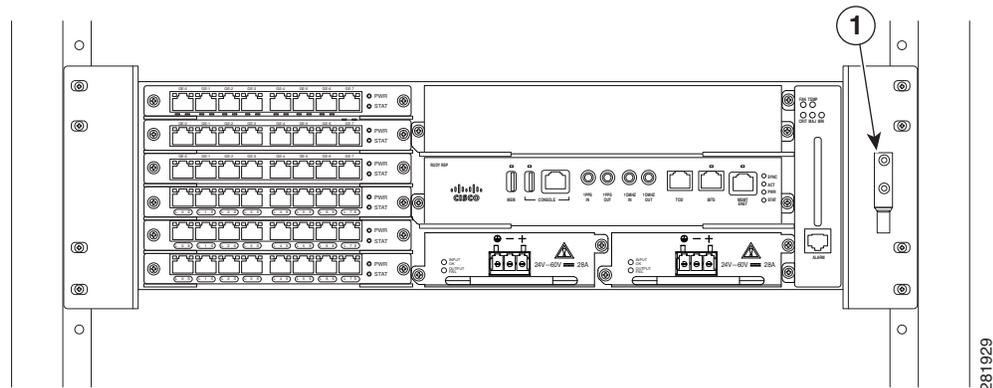
1	Grounding lug (300 mm ETSI cabinet)

To ensure that the chassis ground connection that you provide is adequate, you need the following parts and tools:

- Ratcheting torque screwdriver with Phillips head that exerts up to 15 in.-lb (1.69 N-m) of pressure for attaching the ground wire to the router

- Crimping tool as specified by the ground lug manufacturer

- 18 AWG copper wire for the power cord

- 6 AWG or larger copper wire for the ground wire

- Wire-stripping tools appropriate to the wire you are using

⚠

Caution Before making connections to the Cisco ASR 903 Router, ensure that you disconnect the power at the circuit breaker. Otherwise, severe injury to you or damage to the router may occur.

⚠

Warning **This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.** Statement 1024

⚠

Warning **Use copper conductors only.** Statement 1025

⚠

Warning **When installing the unit, the ground connection must always be made first and disconnected last.** Statement 42

This unit is to be installed in a restrictive access location and must be permanently grounded to minimum 6 AWG copper ground wire.

Perform the following procedure to ground the Cisco ASR 903 Router using a 2-hole lug and the corresponding mounting point. Most carriers require a minimum 6 AWG ground connection. Verify your carrier's requirements for the ground connection.

Step 1 If your ground wire is insulated, use a wire-stripping tool to strip the ground wire to 0.5 inch ± 0.02 inch (12.7 mm ±0.5 mm) (Figure 3-9).

Figure 3-9   Stripping a Ground Wire
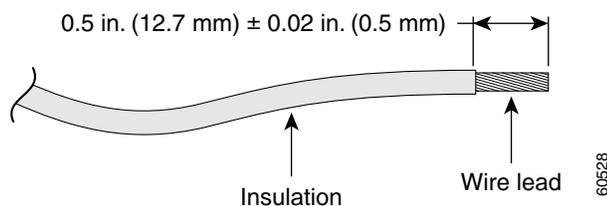
Step 2 Slide the open end of your 2-hole ground lug over the exposed area of the ground wire.

Step 3   Using a crimping tool (as specified by the ground lug manufacturer), crimp the ground lug to the ground wire as shown in Figure 3-10.

Figure 3-10   Crimping a Ground Lug onto the Ground Wire
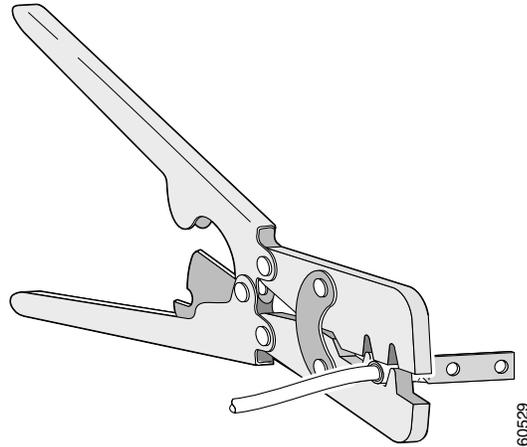
Step 4   Use a Phillips head screwdriver to attach the 2-hole ground lug and wire assembly to the router with the 2 pan-head Phillips head screws. For a 19-inch EIA rack, attach the 2-hole ground lug to the rear of the router.

Step 5   Connect the other end of the ground wire to a suitable grounding point at your site.

Installing the Fan Tray

The fan tray is a modular unit that provides cooling to the Cisco ASR 903 Router. Follow these steps to install the fan tray in the chassis:

Step 1   Orient the fan tray so that the captive screws are on the left side of the fan tray's front panel. Figure 3-11 shows how to orient the fan tray.

Figure 3-11   Installing the Fan Tray
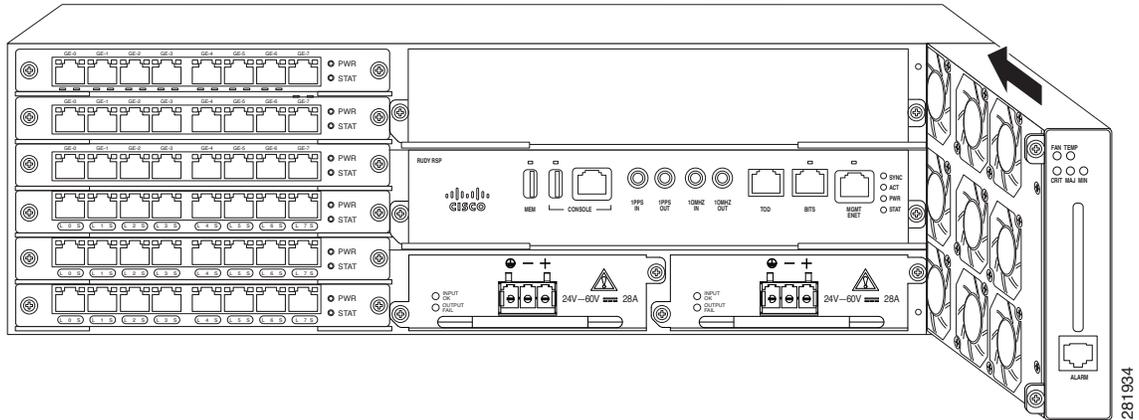
Step 2   Guide the fan tray into the chassis until it is fully seated.

⚠️

Caution   The fans are exposed on the left side of the fan tray. Keep your fingers, clothing, and jewelry away from the fans. Always handle the fan tray by the handle.

✎

Note   When installing the cabling to the RSPs, we recommend that you leave a service loop of extra cabling sufficient to allow for fan tray removal.

Step 3   Secure the fan tray to the chassis using the attached captive installation screws. The recommended maximum torque is 5.5 in.-lb (.62 N-m).

This completes the procedure for installing or replacing the fan tray in a Cisco ASR 903 Router.

For information about connecting cables to the fan tray alarm port, see "Connecting the Fan Tray Alarm Port" section on page 3-42. For a summary of the LEDs on the fan tray, see "LED Summary" section on page 5-7. For more information about air flow guidelines, see Air Flow Guidelines, page 2-11.

Removing and Replacing the Fan Tray

The fan tray supports online insertion and removal (OIR). There is no need to power down the Cisco ASR 903 Router to remove or replace the fan tray. However, the router will shut down if the fan tray is removed from the chassis for more than five minutes.

⚠️
Caution   The router can stay active for up to five minutes if the temperature is below the ambient limit. However, in the event of an overtemperature alarm, the router can shut down in less than five minutes. In the event of a critical temperature alarm, the router shuts down immediately.

⚠️
Caution   To avoid erroneous failure messages, allow at least 2 minutes for the system to reinitialize after the fan tray has been removed or replaced.

Follow these steps to remove and replace the fan tray on the Cisco ASR 903 Router:

Step 1   Using a No. 2 Phillips screwdriver or your fingers, loosen the captive installation screw that secures the fan tray to the chassis. Figure 3-12 shows the front of the fan tray, including the captive installation screws.

Figure 3-12   *Detaching the Fan Tray*

Captive installation screw

FAN TEMP
CRIT MAJ MIN

Handle

ALARM

209393
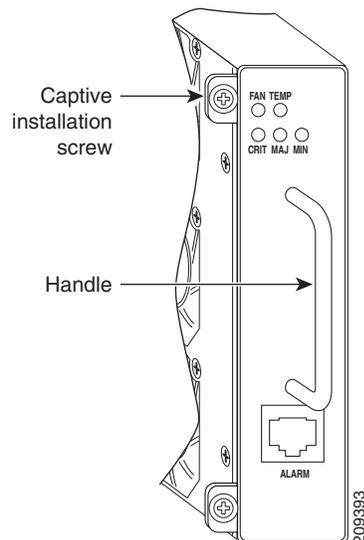
Step 2   Grasp the fan tray handle with one hand and the outside of the chassis with the other hand. Figure 3-12 shows the front of the fan tray, including the handle.

⚠️
Caution   The fans are exposed on the left side of the fan tray. Keep your fingers, clothing, and jewelry away from the fans. Always handle the fan tray by the handle.

Step 3 Pull the fan tray backward toward you no more than 1 inch to disengage it from the power receptacle on the midplane, as shown in Figure 3-13.

Figure 3-13   Fan Tray Removal

⚠
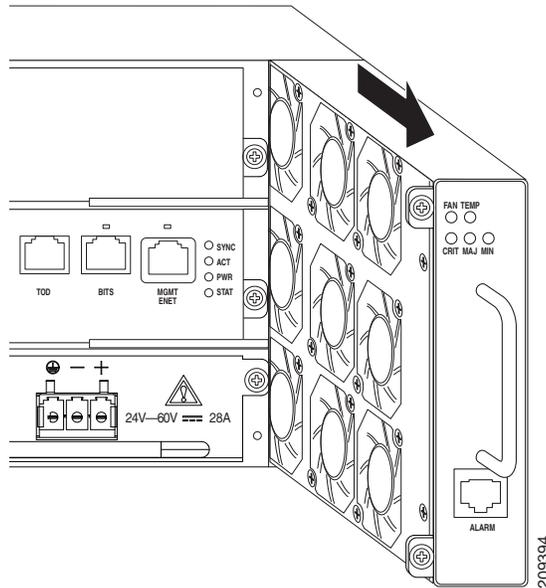
Warning   **When removing the fan tray, keep your hands and fingers away from the spinning fan blades. Let the fan blades completely stop before you remove the fan tray.** Statement 258

Step 4 Wait at least 5 seconds to allow the fans to stop spinning. Then, pull the fan tray backward toward you and out of the chassis.

✎

Note   As the fan tray slides out of the chassis, support the bottom of the fan tray with one hand and keep your other hand on the fan tray handle.

This completes the steps for removing the fan tray from the chassis.

To install the new fan tray, follow the steps in "Installing the Fan Tray" section on page 3-8.

RSP Installation

Follow these steps on handling an RSP module in the Cisco ASR 903 Router:

- Installing an RSP Module, page 3-11
- Removing an RSP Module, page 3-12
- Hot-Swapping an RSP Module, page 3-13

Installing an RSP Module

To install an RSP module in the router chassis, perform the following steps:

Step 1   Choose a slot for the module. Make sure that there is enough clearance to accommodate any equipment that will be connected to the ports on the module. If a blank module filler plate is installed in the slot in which you plan to install the module, remove the plate by removing its 2 Phillips pan-head screws.

Step 2   Fully open both the ejector levers on the new module, as shown in Figure 3-14.

⚠️

Caution   To prevent ESD damage, handle modules by carrier edges only.

Step 3   Position the module in the slot. Make sure that you align the sides of the module with the guides on each side of the slot, as shown in Figure 3-14.

Figure 3-14   Cisco ASR 903 Router RSP Installation
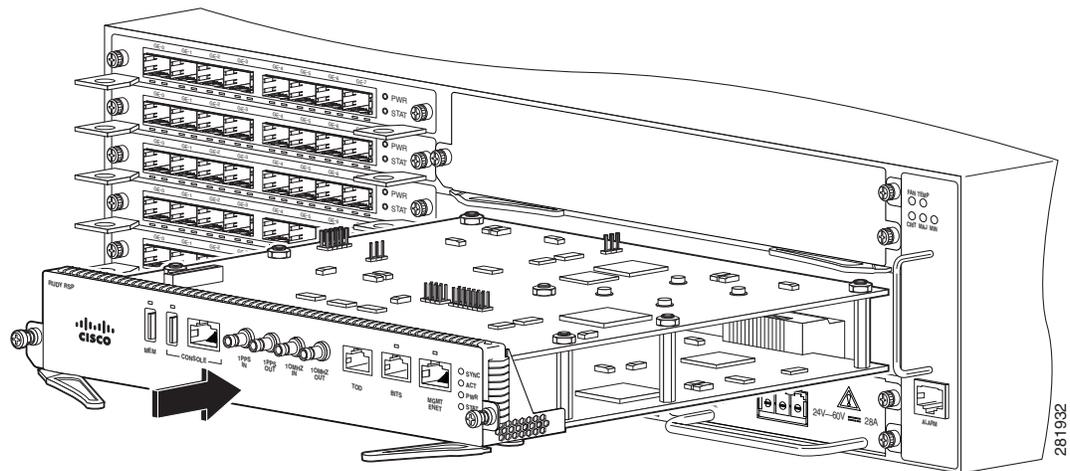
Step 4   Carefully slide the module into the slot until the EMI gasket on the module makes contact with the module in the adjacent slot and both the ejector levers have closed to approximately 45 degrees with respect to the module faceplate.

⚠️

Caution   If the top slot already has an RSP module installed, and you install a second RSP module in the slot below it, be careful not to damage the EMI gasket of the bottom RSP module against the ejector levers of the top RSP during insertion.

Step 5   While pressing down, simultaneously close both the ejector levers to fully seat the module in the backplane connector. The ejector levers are fully closed when they are flush with the module faceplate.

Step 6   Tighten the two captive installation screws on the module. The recommended maximum torque is 5.5 in.-lb (.62 N-m).

✎

Note   Make sure that the ejector levers are fully closed before tightening the captive installation screws.

Step 7 Verify that the captive installation screws are tightened on all of the modules installed in the chassis. This step ensures that the EMI gaskets on all the modules are fully compressed in order to maximize the opening space for the new or replacement module.

> **Note** If the captive installation screws are loose, the EMI gaskets on the installed modules will push adjacent modules toward the open slot, which reduces the size of the opening and makes it difficult to install the new module.

> **Note** Blank module filler plates (Cisco part number A900-RSPA-BLANK) should be installed in any empty chassis slots to keep dust out of the chassis and to maintain consistent airflow through the chassis.

> **Note** When installing the cabling to an RSP, we recommend that you leave a service loop of extra cabling sufficient to allow for fan tray removal.

Removing an RSP Module

Before you remove an RSP from the router, you should save the current configuration using the **write {host file | network | terminal}** command. This saves you time when bringing the module back online.

If the module is running Cisco IOS software, save the current running configuration by entering the **copy running-config startup-config** command.

> **Warning** **Hazardous voltage or energy is present on the backplane when the system is operating. Use caution when servicing.** Statement 1034

> **Warning** **Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.** Statement 1051

To remove an RSP module, perform the following steps:

Step 1 Disconnect any cables attached to the ports on the module.

Step 2 Verify that the captive installation screws on all the modules in the chassis are tight. This step ensures that the space created by the removed module is maintained.

> **Note** If the captive installation screws are loose, the EMI gaskets on the installed modules will push the modules toward the open slot, which in turn reduces the size of the opening and makes it difficult to remove the module.

Step 3 Loosen the two captive installation screws on the module you plan to remove from the chassis.

Step 4 Place your thumbs on the ejector levers (see Figure 3-14) and simultaneously rotate the ejector levers outward to unseat the module from the backplane connector.

Step 5   Grasp the front edge of the module and slide the module straight out of the slot. If the chassis has horizontal slots, place your hand under the module to support its weight as you slide it out from the slot. Do not touch the module circuitry.

⚠

Caution   To prevent ESD damage, handle modules by the carrier edges only.

Step 6   Place the module on an antistatic mat or antistatic foam, or immediately reinstall the module in another slot.

Step 7   Install blank module filler plates (Cisco part number A900-RSPA-BLANK) in empty slots, if any.

⚠

Warning   **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 1029

Hot-Swapping an RSP Module

The Cisco ASR 903 Router provides a feature that allows you to remove and replace a redundant RSP module without powering down the router. This feature, called hot-swapping or OIR, allows you to remove and replace a redundant module without disrupting router operation.

When two redundant modules are installed in the router, only one of the modules is active. The other one runs in standby mode, ready to take over processing if the active module fails.

When you remove or insert a redundant module while the router is powered on and running, the router does the following:

1. Determines if there is sufficient power for the module.

2. Scans the backplane for configuration changes.

3. Initializes the newly inserted module. In addition, the system notes any removed modules and places those modules in the administratively shutdown state.

4. Places any previously configured interfaces on the module back to the state they were in when they were removed. Any newly inserted interfaces are put in the administratively shutdown state as if they were present (but unconfigured) at boot time. If you insert the same type of module into a slot, its ports are configured and brought online up to the port count of the original module.

The router runs diagnostic tests on any new interfaces and the test results indicate the following:

- If the tests pass, the router is operating normally.

- If the new module is faulty, the router resumes normal operation but leaves the new interfaces disabled.

- If the diagnostic tests fail, the router stops operating, which usually indicates that the new module has a problem in the bus and should be removed.

Use the following guidelines when performing an OIR on an IM:

- Allow at least 2 minutes for the system to reinitialize before inserting a new IM.

- Avoid inserting a new IM during bootup until the active and standby RSPs have reached an OK state.

- When inserting multiple IMs into the chassis, wait until each IM reaches an OK state before inserting the next IM.

Interface Module Installation

The following sections describe the various tasks of associated with interface module installation on the Cisco ASR 903 Router:

- Installing an Interface Module, page 3-14
- Removing an Interface Module, page 3-15
- Hot-Swapping an Interface Module, page 3-15

Installing an Interface Module

Step 1   Before inserting an interface module, make sure that the chassis is grounded.

Step 2   To insert the interface module, carefully align the edges of the interface module between the upper and lower edges of the router slot.

Step 3   Carefully slide the interface module into the router slot until the interface module makes contact with the backplane. Figure 3-15 shows how to install the interface module.

Figure 3-15   Inserting an Interface Module
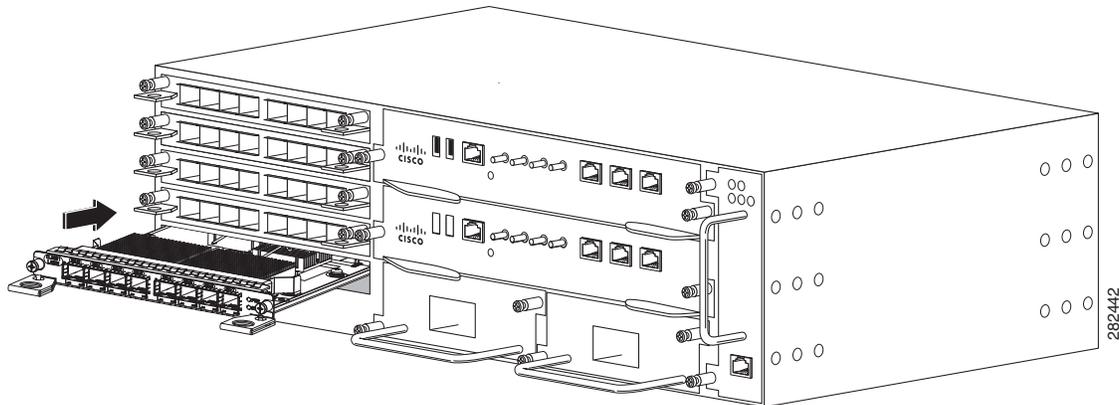
Step 4   Tighten the locking thumbscrews on both sides of the interface module. The recommended maximum torque is 5.5 in.-lb (.62 N-m).

Step 5   Connect all the cables to each interface module.

✎
Note   10 Gigabit Ethernet interface modules are not supported in slots 4 and 5.

⚠

Caution   Do not use interface module and power supply ejector handles to lift the chassis; using the handles to lift the chassis can deform or damage the handles.

Removing an Interface Module

Step 1   To remove an interface module, disconnect all the cables from each interface module.

Step 2   Loosen the locking thumbscrews on both sides of the interface module.

Step 3   Slide the interface module out of the router slot by pulling on the handles. If you are removing a blank filler plate, pull the blank filler plate completely out of the router slot using the captive screws.

Hot-Swapping an Interface Module

The Cisco ASR 903 Router provides a feature that allows you to remove and replace an interface module without powering down the router. This feature, called hot-swapping or OIR, allows you to remove and replace a redundant module without disrupting router operation.

Note   The Cisco ASR 903 Router does not support hot-swapping an interface module with another module of a different type. For example, you cannot swap an SFP Gigabit Ethernet module with a copper Gigabit Ethernet module without disrupting router operation.

Note   If you perform OIR on an interface module and move the module to a different slot, the router does not retain the module configuration; you must reconfigure the interface module.

When you remove or insert a redundant module while the router is powered on and running, the router does the following:

1.   Determines if there is sufficient power for the module.

2.   Scans the backplane for configuration changes.

3.   Initializes the newly inserted module. In addition, the system notes any removed modules and places those modules in the administratively shutdown state.

4.   Places any previously configured interfaces on the module back to the state they were in when they were removed.

The router runs diagnostic tests on any new interfaces and the test results indicate the following:

•   If the tests pass, the router is operating normally.

•   If the new module is faulty, the router resumes normal operation but leaves the new interfaces disabled.

•   If the diagnostic tests fail, the router stops operating, which usually indicates that the new module has a problem in the bus and should be removed.

⚠

Caution   To avoid erroneous failure messages, note the current configuration of all interfaces before you remove or replace an interface module, and allow at least 2 minutes for the system to reinitialize after a module has been removed or replaced. This time is recommended in order to allow for synchronization between components within the interface module and for synchronization with the standby RSP.

Installing the Power Supply

The Cisco ASR 903 Router router provides the choice of two different power supplies:

- DC power—19.2VDC to -72VDC

    The DC power supply uses 3 position terminal block-style connector with positive latching/securing and labeled connections for +24/48V, GRD, -24/48V. The terminal block connector is of suitable size to carry the appropriate AWG wire size to handle the input current of the power supply. No ON/OFF switch is provided.

- AC power—85VAC to 264VAC

    The AC power supply has an IEC 320-type power receptacle and a 15 Amp service connector. You can use standard right angle power cords with the AC power supply. The power supply includes a power cord retainer. No ON/OFF switch is provided.

Each power supply provides a single primary input power connection. You can install dual power supplies for redundancy.

⚠️ **Warning**   **Read the installation instructions before connecting the system to the power source.** Statement 10

✎ **Note**   Products that have an AC power connection are required to have an external surge protective device (SPD) provided as part of the building installation to comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety.

⚠ **Caution**   Do not use interface module and power supply ejector handles to lift the chassis; using the handles to lift the chassis can deform or damage the handles.

The following sections describe the Cisco ASR 903 Router power supplies:

- Preventing Power Loss, page 3-17
- Power Connection Guidelines, page 3-18
- Installing the DC Power Supply, page 3-19
- Removing and Replacing the DC Power Supply, page 3-24
- Installing the AC power Supply, page 3-25

Preventing Power Loss

Use the following guidelines to prevent power loss to the router.

- To prevent loss of input power, ensure that the total maximum load on each circuit supplying the power supplies is within the current ratings of the wiring and breakers.
- In some systems, you can use an UPS to protect against power failures at your site. Avoid UPS types that use ferroresonant technology. These UPS types can become unstable with systems like the Cisco ASR 903 Router, which can have substantial current draw fluctuations due to bursty data traffic patterns.

Use the information in the "DC Power Specifications" section on page 1-4 to estimate the power requirements and heat dissipation of a Cisco ASR 903 Router based on a given configuration of the router. Determining power requirements is useful for planning the power distribution system needed to support the router.

Power Connection Guidelines

This section provides guidelines for connecting the Cisco ASR 903 Router power supplies to the site power source.

⚠ **Warning** **Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.** Statement 213

⚠ **Warning** **The plug-socket combination must be accessible at all times because it serves as the main disconnecting device.** Statement 1019

⚠ **Warning** **This product requires short-circuit (overcurrent) protection, to be provided as part of the building installation. Install only in accordance with national and local wiring regulations.** Statement 1045

Guidelines for DC-Powered Systems

Basic guidelines for DC-powered systems include the following:

- Each chassis power supply should have its own dedicated input power source. The source must comply with the safety extra-low voltage (SELV) requirements in the UL 60950, CSA 60950, EN 60950, and IEC 60950 standards.
- The circuit must be protected by a dedicated two-pole circuit breaker. The circuit breaker should be sized according to the power supply input rating and local or national code requirements.
- The circuit breaker is considered the disconnect device and should be easily accessible.
- The system ground is the power supply and chassis ground.
- Do not connect the DC return wire to the system frame or to the system grounding equipment.
- Use the grounding lug to attach a wrist strap for ESD protection during servicing.

Guidelines for AC-Powered Systems

Basic guidelines for AC-powered systems include the following:

- Each chassis power supply should have its own dedicated branch circuit.
- The circuit breaker should be sized according to the power supply input rating and local or national code requirements.
- The AC power receptacles used to plug in the chassis must be the grounding type. The grounding conductors that connect to the receptacles should connect to protective earth ground at the service equipment.

Installing the DC Power Supply

The following sections describe how to install a DC power supply in the Cisco ASR 903 Router:

> **Note** This equipment is suitable for installation in Network Telecommunications Facilities and locations where the NEC applies.

> **Note** This equipment is suitable for installations utilizing the Common Bonding Network (CBN).

> **Note** The grounding architecture of this product is DC-Isolated (DC-I) for DC-powered products. DC-powered products have a nominal operating DC voltage of 48 VDC.

Installing the DC Power Supply Module

Perform the following procedure to install the power supply module:

Step 1 Ensure that the system (earth) ground connection has been made. For ground connection installation instructions, see the "Installing the Chassis Ground Connection" section on page 3-5.

Step 2 If necessary, remove the blank power supply filler plate from the chassis power supply bay opening by loosening the captive installation screws.

Step 3 Verify that power to the DC circuit connected to the power supply you are installing is off. To ensure that power has been removed from the DC circuits, locate the circuit breakers for the DC circuits, switch the circuit breakers to the OFF position, and tape the circuit-breaker switches in the OFF position.

Step 4 Grasp the power supply handle with one hand. Place your other hand underneath the power supply, as shown in Figure 3-16. Slide the power supply into the power supply bay. Make sure that the power supply is fully seated in the bay.

Figure 3-16   *Installing the DC Power Supply*
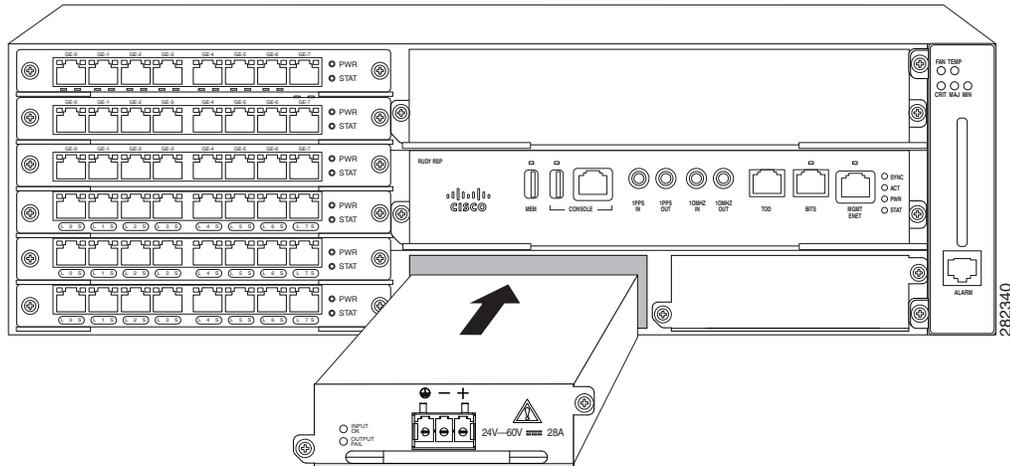
Step 5   Tighten the captive installation screws of the power supply. The recommended maximum torque is 5.5 in.-lb (.62 N-m).

If you are installing a redundant DC power supply, repeat these steps for the second power source.

Installing the Terminal Block

Perform the following procedure to install the terminal block:

Step 1   Locate the terminal block plug.

Step 2   Use a wire-stripping tool to strip the ends of each of the two wires coming from the DC-input power source to 0.27 inch (6.6 mm) ± 0.02 inch (0.5 mm) and the wire for grounding. Do not strip more than 0.29 inch (7.4 mm) of insulation from the wire. Stripping more than the recommended amount of wire can leave behind exposed wire from the terminal block plug after installation.

Step 3   Identify the ground, positive, and negative feed positions for the terminal block connection. The recommended wiring sequence is:

a.   Ground lead wire (right)

b.   Negative (-) lead wire (left)

c.   Positive (+) lead wire (middle)

Figure 3-17   *DC Power Supply with Lead Wires*
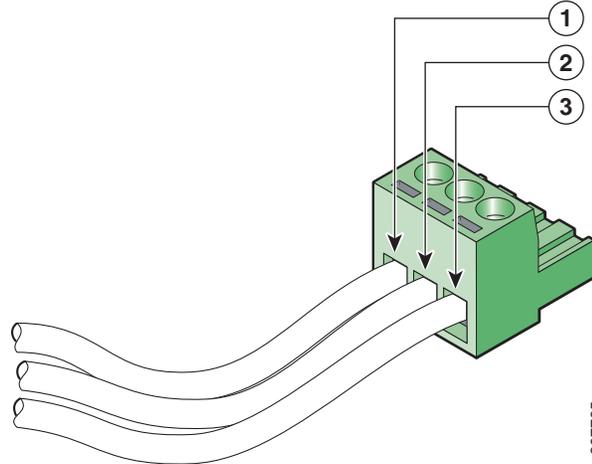
1	Ground lead wire	**3**	Positive (+) lead wire
2	Negative (–) lead wire	**—**	—

Step 4   Insert the exposed wire of one of the three DC-input power source wires into the terminal block plug. Make sure that you cannot see any wire lead. Only wire with insulation should extend from the terminal block.

⚠

Caution   Do not overtorque the plug captive screws of the terminal block. The recommended maximum torque is from 4.425 in.-lb (.5 N-m) to 5.310 in-lb (.6 N-m).

Step 5 Use a ratcheting torque screwdriver to torque the terminal block plug captive screw (above the installed wire lead) from 4.425 in.-lb (.5 N-m) to 5.310 in-lb (.6 N-m) as shown in Figure 3-18.

Figure 3-18   *Torquing the DC Power Supply Terminal Block Plug Screws*
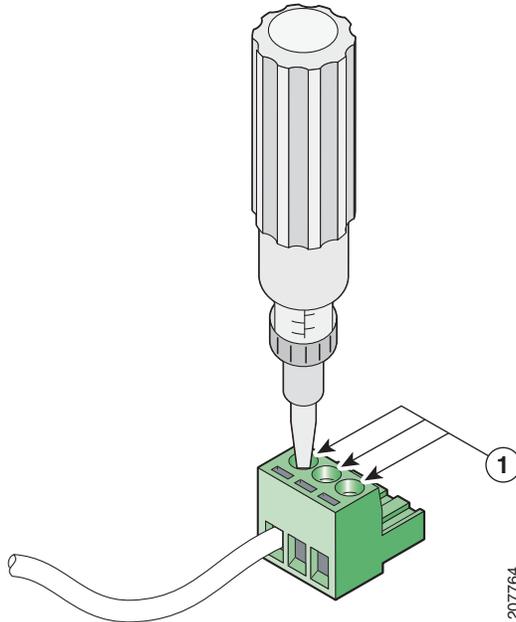
1	Torque is from 4.425 in.-lb (.5 N-m) to 5.310 in-lb (.6 N-m).

Step 6 Repeat Step 4 through Step 5 for the remaining DC input power source wire and the ground wire. Figure 3-19 shows the wiring completed for a terminal block plug.

Figure 3-19   *Inserting the DC Power Supply Terminal Block Plug in the Block Header*
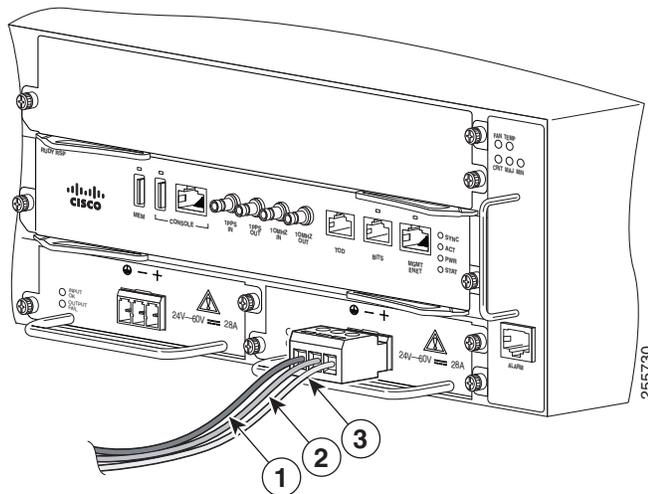
1	DC power supply ground lead wire	3	DC power supply positive (+) lead wire
2	DC power supply negative (-) lead wire	—	—

> ⚠️
>
> **Caution**   Secure the wires coming in from the terminal block plug so that they cannot be disturbed by casual contact.

Step 7   Ensure that the terminal block plug is fully seated in the terminal block header on the DC power supply panel. The plug has a locking feature. You should hear a snap or click when it is installed properly.

Step 8   Use a tie wrap to secure the wires to the rack, so that the wires are not pulled from the terminal block plug by casual contact. Make sure the tie wrap allows for some slack in the ground wire, as shown in Figure 3-20.

Figure 3-20   Complete DC Terminal Block Plug Insertion and Secure Tie Wrap
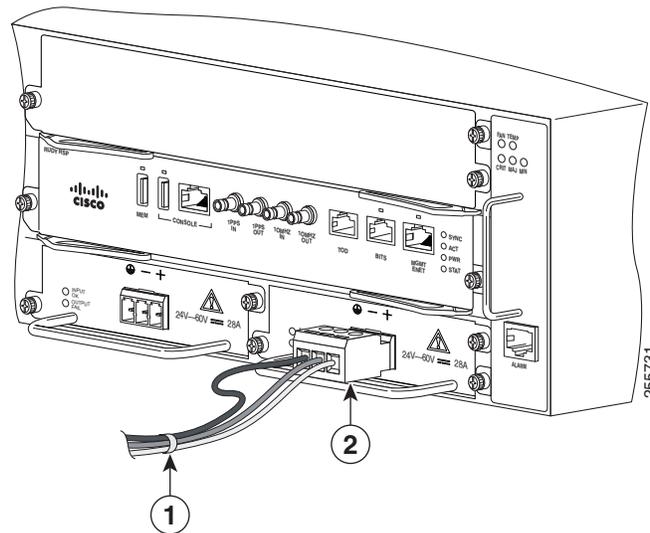
1	Lead wires secured with a tie wrap	2	DC power supply terminal block plug being inserted into terminal block header.

Step 9   Use a tie wrap to secure the wires to the handle. Leave a service loop on the ground wire between the handle and the connector such that it is the last to receive strain if the wires are pulled.

This completes the procedure for connecting the DC power supply in the Cisco ASR 903 Router.

If you are installing a redundant DC power supply, repeat these steps for the second power source.

Activating the DC Power Supply

Perform the following procedure to activate the DC power supply:

Step 1   Remove the tape from the circuit-breaker switch handle, and restore power by moving the circuit-breaker switch handle to the On (|) position.

Step 2   Verify power supply operation by checking if the power supply front panel LEDs are in the following states:

- INPUT OK LED is green
- OUTPUT FAIL LED is green

If the LEDs indicate a power problem, see Chapter 5, "Troubleshooting."

If you are installing a redundant DC power supply, ensure that each power supply is connected to a separate power source in order to prevent power loss in the event of a power failure.

If you are installing a redundant DC power supply, repeat these steps for the second power source.

Removing and Replacing the DC Power Supply

This section provides information about removing and replacing the DC power supply in the Cisco ASR 903 Router.

Note The Cisco ASR 903 Router power supplies are hot-swappable. If you have installed redundant power supply modules, you can replace a single power supply without interrupting power to the router.

Caution To avoid erroneous failure messages, allow at least 2 minutes for the system to reinitialize after a power supply has been removed or replaced.

Warning **When you install the unit, the ground connection must always be made first and disconnected last.** Statement 1046

Warning **Before performing any of the following procedures, ensure that power is removed from the DC circuit.** Statement 1003

Warning **Only trained and qualified personnel should be allowed to install, replace, or service this equipment.** Statement 1030

Warning **Installation of the equipment must comply with local and national electrical codes.** Statement 1074

Follow these steps to remove and replace the DC power supply on the Cisco ASR 903 Router:

Step 1 Before servicing the power supply, switch off the circuit breaker in your equipment area. As an additional precaution, tape the circuit-breaker switch in the Off position.

Step 2 Slip on the ESD-preventive wrist strap that was included in the accessory kit.

Step 3 Switch the power supply circuit-breaker switch to the Off (O) position.

Step 4 Pull the terminal block plug connector out of the terminal block head in the power supply.

Step 5 Loosen the captive screws on the DC power supply.

Step 6 Grasping the power supply handle with one hand, pull the power supply out from the chassis while supporting it with the other hand.

Step 7   Replace the DC power supply within 5 minutes. If the power supply bay is to remain empty, install a blank filler plate (Cisco part number A900-PWR-BLANK) over the opening, and secure it with the captive installation screws.

Installing the AC power Supply

The following sections describe how to install a AC power supply in the Cisco ASR 903 Router:

- Installing the AC Power Supply Module, page 3-25
- Activating the AC Power Supply, page 3-26

> ⚠ **Warning**   **This product requires short-circuit (over current) protection, to be provided as part of the building installation. Install only in accordance with national and local wiring regulations.**

Installing the AC Power Supply Module

Follow these steps to install the power supply module:

Step 1   Ensure that the system (earth) ground connection has been made. For ground connection installation instructions, see the "Installing the Chassis Ground Connection" section on page 3-5.

Step 2   If necessary, remove the blank power supply filler plate from the chassis power supply bay opening by loosening the captive installation screws.

Step 3   Grasp the power supply handle with one hand. Place your other hand underneath the power supply, as shown in Figure 3-21. Slide the power supply into the power supply bay. Make sure that the power supply is fully seated in the bay.

Figure 3-21   Installing the AC Power Supply
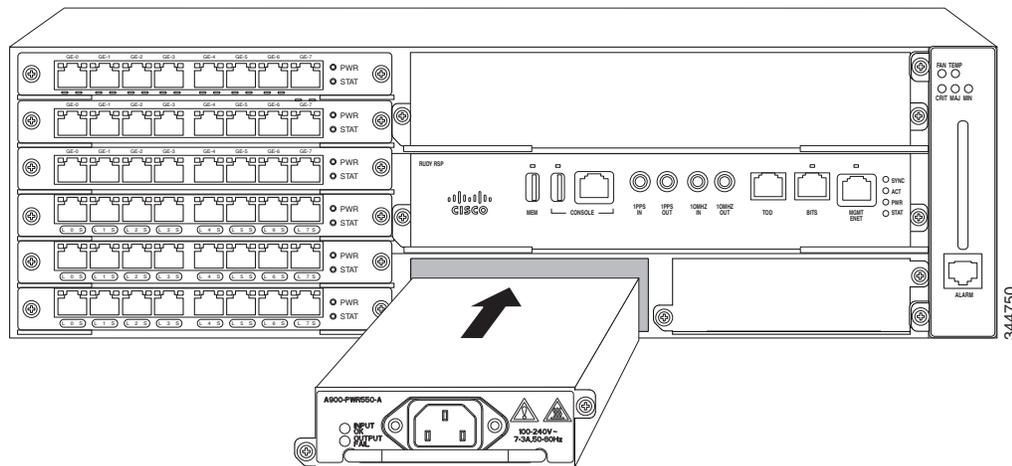
Step 4   Tighten the captive installation screws of the power supply. The recommended maximum torque is 5.5 in.-lb (.62 N-m).

> ⚠ **Warning**   **Power supply captive installation screws must be tight to ensure protective grounding continuity.**

Activating the AC Power Supply

Follow these steps to activate the AC power supply:

Step 1   Plug the power cord into the power supply.

Step 2   Connect the other end of the power cord to an AC-input power source.

Step 3   Verify power supply operation by checking that the power supply LEDs are in the following states:

- INPUT OK LED is green
- OUTPUT FAIL LED is green

Step 4   If the LEDs indicate a power problem, see the Chapter 5, "Troubleshooting"for troubleshooting information.

Step 5   If you are installing a redundant power supply, repeat these steps for the second power source.

Note   If you are installing a redundant AC power supply, ensure that each power supply is connected to a separate power source in order to prevent power loss in the event of a power failure.

Removing and Replacing the AC Power Supply

This section describes how to remove and replace the AC power supply.

Note   The Cisco ASR 903 Router power supplies are hot-swappable. If you have installed redundant power supply modules, you can replace a single power supply without interrupting power to the router.

Caution   To avoid erroneous failure messages, allow at least 2 minutes for the system to reinitialize after a power supply has been removed or replaced.

Warning   **When you install the unit, the ground connection must always be made first and disconnected last.** Statement 1046

Warning   **Before performing any of the following procedures, ensure that power is removed from the DC circuit.** Statement 1003

Warning   **Only trained and qualified personnel should be allowed to install, replace, or service this equipment.** Statement 1030

Warning   **Installation of the equipment must comply with local and national electrical codes.** Statement 1074

Follow these steps to remove and replace the AC power supply:

Step 1   Disconnect the power cord from the power source. Do not touch the metal prongs on the power cord when it is still connected to the power supply.

Step 2   Remove the power cord from the power connection on the power supply. Do not touch the metal prongs embedded in the power supply.

Step 3   Loosen the captive installation screws.

Step 4   Grasp the AC power supply with one hand, and slide it part of the way out of the chassis. Place your other hand underneath the power supply, and slide it completely out of the chassis.

Step 5   If the power supply bay is to remain empty, install a blank filler plate (Cisco part number A900-PWR-BLANK) over the opening, and secure it with the captive installation screws.

Connecting the Cisco ASR 903 Router to the Network

The following sections describe how to connect cables on the Cisco ASR 903 Router:

- Connecting Console Cables, page 3-27
- Connecting to the Auxiliary Port, page 3-33
- Connecting a Management Ethernet Cable, page 3-35
- Installing and Removing SFP and XFP Modules, page 3-35
- Connecting a USB Flash Device, page 3-35
- Connecting Timing Cables, page 3-36
- Connecting Ethernet Cables, page 3-39
- Connecting Cables to SFP Modules, page 3-40
- Connecting T1/E1 cables, page 3-40
- Connecting the Fan Tray Alarm Port, page 3-42
- Connector and Cable Specifications, page 3-43

Note   When installing the cabling to the RSPs, we recommend that you leave a service loop of extra cabling sufficient to allow for fan tray removal.

Connecting Console Cables

The following sections describe how to connect to the Cisco ASR 903 Router using console cables:

- Connecting to the Serial Port using Microsoft Windows, page 3-28
- Connecting to the Console Port using Mac OS X, page 3-30
- Connecting to the Console Port using Linux, page 3-30
- Installing the Cisco Microsoft Windows USB Device Driver, page 3-31
- Uninstalling the Cisco Microsoft Windows USB Driver, page 3-32

Note   You cannot use the USB and RS232 console ports at the same time; if you insert the USB cable into the router, the RS232 port is disabled.

Connecting to the Serial Port using Microsoft Windows

This procedure shows how to connect to the serial port using Microsoft Windows.

Note Install the USB device driver before establishing a physical connection between the router and the PC, by using the USB Console cable plugged into the USB serial port. Otherwise, the connection will fail. For more information, see the "Installing the Cisco Microsoft Windows USB Device Driver" section on page 3-31.

Step 1 Connect the end of the console cable with the RJ45 connector to the light blue console port on the router.

or

Connect a USB Type A-to-Type A cable to the USB console port as shown in Figure 3-22. If you are using the USB serial port for the first time on a Windows-based PC, install the USB driver now according to the instructions in the following sections.

- "Installing the Cisco Microsoft Windows XP USB Driver" section on page 3-31
- "Installing the Cisco Microsoft Windows 2000 USB Driver" section on page 3-31
- "Installing the Cisco Microsoft Windows Vista USB Driver" section on page 3-32

Note You cannot use the USB port and the EIA port concurrently. See "Connecting to the Auxiliary Port" section on page 3-33. When the USB port is used it takes priority over the RJ45 EIA port.

Note The USB Type A-to-Type A cable is not included with the Cisco ASR 903 Router; it is ordered separately.

Step 2 Connect the end of the cable with the DB-9 connector (or USB Type-A) to the terminal or PC. If your terminal or PC has a console port that does not accommodate a DB-9 connector, you must provide an appropriate adapter for that port.

Step 3 To communicate with the router, start a terminal emulator application, such as Microsoft Windows HyperTerminal. This software should be configured with the following parameters:

- 9600 baud
- 8 data bits
- no parity
- 1 stop-bit
- no flow control

Figure 3-22   Connecting the USB Console Cable to the Cisco ASR 903 Router
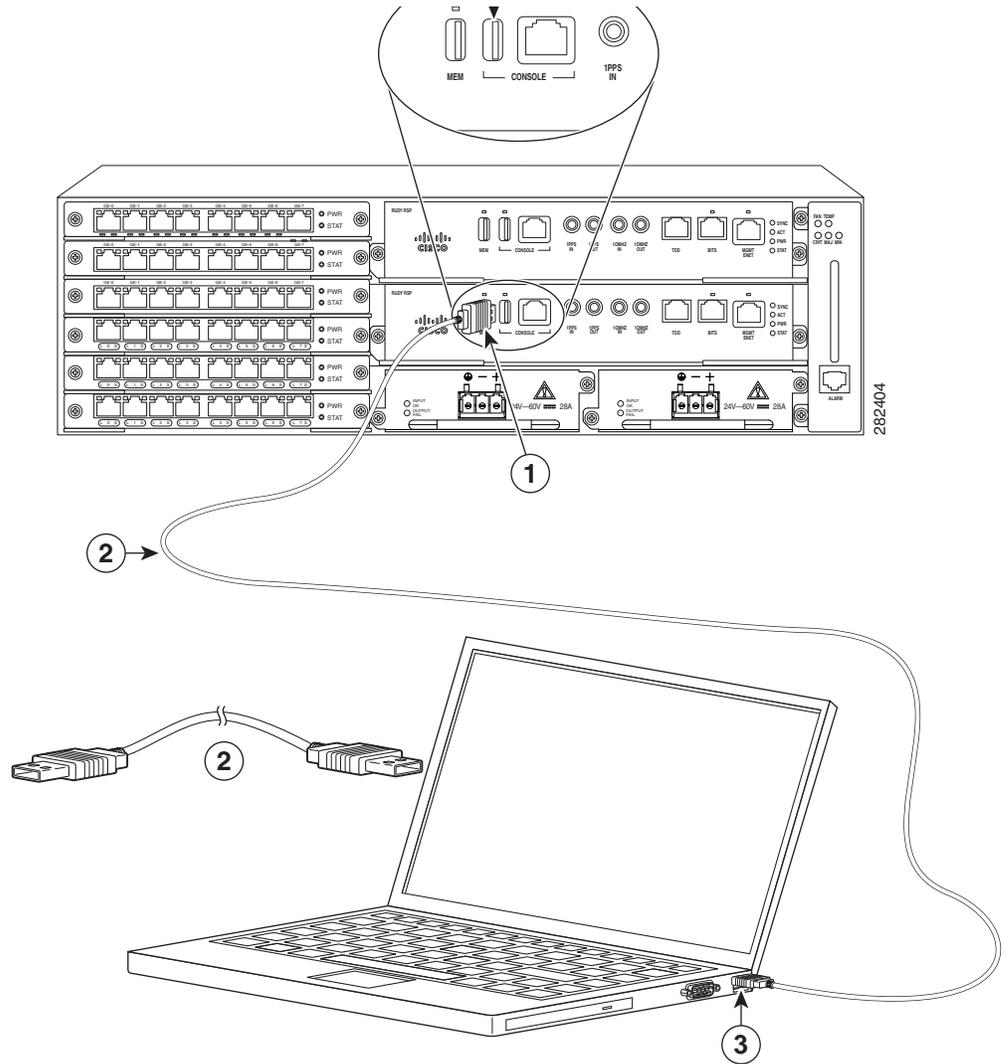
1	USB Type-A console port	2	USB 5-pin mini USB Type-B to USB Type-A console cable
3	USB Type-A	—	—

Connecting to the Console Port using Mac OS X

This procedure describes how to connect a Mac OS X system USB port to the console using the built in OS X Terminal utility.

Step 1   Use the Finder to go to **Applications** > **Utilities** > **Terminal**.

Step 2   Connect the OS X USB port to the router.

Step 3   Enter the following commands to find the OS X USB port number:

```
macbook:user$ cd /dev
macbook:user$ ls -ltr /dev/*usb*
crw-rw-rw-  1 root    wheel      9,  66 Apr  1 16:46 tty.usbmodem1a21
DT-macbook:dev user$
```

Step 4   Connect to the USB port with the following command followed by the router USB port speed

```
macbook:user$ screen /dev/tty.usbmodem1a21 9600
```

To disconnect the OS X USB console from the Terminal window

Enter **Ctrl-a** followed by **Ctrl-**

Connecting to the Console Port using Linux

This procedure shows how to connect a Linux system USB port to the console using the built in Linux Terminal utility.

Step 1   Open the Linux Terminal window.

Step 2   Connect the Linux USB port to the router.

Step 3   Enter the following commands to find the Linux USB port number

```
root@usb-suse# cd /dev
root@usb-suse /dev# ls -ltr *ACM*
crw-r--r--   1 root    root    188,  0 Jan 14 18:02 ttyACM0
root@usb-suse /dev#
```

Step 4   Connect to the USB port with the following command followed by the router USB port speed

```
root@usb-suse /dev# screen /dev/ttyACM0 9600
```

To disconnect the Linux USB console from the Terminal window

Enter **Ctrl-a** followed by **:** then **quit**

Installing the Cisco Microsoft Windows USB Device Driver

A USB device driver must be installed the first time a Microsoft Windows-based PC is connected to the USB serial port on the router.

This section contains the following topics:

Installing the Cisco Microsoft Windows XP USB Driver

This procedure shows how to install the Microsoft Windows XP USB driver. Download the driver for your router model from the Tools and Resources Download Software site, USB Console Software category, at the following URL:

http://tools.cisco.com/support/downloads/go/Redirect.x?mdfid=268437899

Step 1 Unzip the file Cisco_usbconsole_driver_X_X.zip (where X is a revision number).

Step 2 If using 32-bit Windows XP double-click the file setup.exe from the Windows_32 folder, or if using 64-bit Windows XP double-click the file setup(x64).exe from the Windows_64 folder.

Step 3 The Cisco Virtual Com InstallShield Wizard begins. Click **Next**.

Step 4 The Ready to Install the Program window appears, Click **Install**.

Step 5 The InstallShield Wizard Completed window appears. Click **Finish.**

Step 6 Connect the USB cable to the PC and router USB console ports. The EN LED for the USB console port turns green, and within a few moments the Found New Hardware Wizard appears. Following the instructions to complete the installation of the driver.

Step 7 The USB console is ready for use.

Installing the Cisco Microsoft Windows 2000 USB Driver

This procedure shows how to install the Microsoft Windows 2000 USB driver.

Step 1 Obtain the file Cisco_usbconsole_driver.zip from the Cisco.com web site and unzip it.

Step 2 Double-click the file setup.exe.

Step 3 The Cisco Virtual Com InstallShield Wizard begins. Click **Next**.

Step 4 The Ready to Install the Program window appears, Click **Install**.

Step 5 The InstallShield Wizard Completed window appears. Click **Finish.**

Step 6 Connect the USB cable to the PC and router USB console ports. The EN LED for the USB console port turns green, and within a few moments a series of Found New Hardware Wizard windows appear. Following the instructions to complete the installation of the driver.

Step 7 The USB console is ready for use.

Installing the Cisco Microsoft Windows Vista USB Driver

This procedure shows how to install the Microsoft Windows Vista USB driver.

Step 1   Obtain the file Cisco_usbconsole_driver.zip from the Cisco.com web site and unzip it.

Step 2   If using 32-bit Windows Vista double-click the file setup.exe from the Windows_32 folder, or if using 64-bit Windows Vista double-click the file setup(x64).exe from the Windows_64 folder.

Step 3   The Cisco Virtual Com InstallShield Wizard begins. Click **Next**.

Step 4   The Ready to Install the Program window appears, Click **Install**.

> **Note**   If a User Account Control warning appears, click "Allow - I trust this program..." to proceed.

Step 5   The InstallShield Wizard Completed window appears. Click **Finish.**

Step 6   Connect the USB cable to the PC and router USB console ports. The EN LED for the USB console port turns green, and within a few moments a pop up window stating "Installing device driver software" appears. Following the instructions to complete the installation of the driver.

Step 7   The USB console is ready for use.

Uninstalling the Cisco Microsoft Windows USB Driver

This section provides instructions for how to uninstall the Cisco Microsoft Windows USB device driver.

- "Uninstalling the Cisco Microsoft Windows XP and 2000 USB Driver"
- "Uninstalling the Cisco Microsoft Windows Vista USB Driver"

Uninstalling the Cisco Microsoft Windows XP and 2000 USB Driver

This procedure shows you how to uninstall both the Microsoft Windows XP and 2000 USB driver. The driver can be removed using the Windows Add Remove Programs utility or the setup.exe program.

Using the Add Remove Programs Utility

> **Note**   Disconnect the router console terminal before uninstalling the driver.

Step 1   Click **Start** > **Control Panel** > **Add or Remove** Programs.

Step 2   Scroll to Cisco Virtual Com and click **Remove**.

Step 3   When the Program Maintenance window appears, select the **Remove** radio button. Click **Next**.

Using the Setup.exe Program

> **Note**   Disconnect the router console terminal before uninstalling the driver.

Step 1 Run the setup.exe for Windows 32-bit or setup(x64).exe for Windows-64bit. Click **Next**.

Step 2 The InstallShield Wizard for Cisco Virtual Com appears. Click **Next**.

Step 3 When the Program Maintenance window appears, select the **Remove** radio button. Click **Next**.

Step 4 When the Remove the Program window appears, click **Remove**.

Step 5 When the InstallShield Wizard Completed window appears click **Finish**.

Uninstalling the Cisco Microsoft Windows Vista USB Driver

This procedure shows you how to uninstall the Microsoft Windows Vista USB driver.

> **Note** Disconnect the router console terminal before uninstalling the driver.

Step 1 Run the setup.exe for Windows 32-bit or setup(x64).exe for Windows-64bit. Click **Next**.

Step 2 The InstallShield Wizard for Cisco Virtual Com appears. Click **Next**.

Step 3 When the Program Maintenance window appears, select the **Remove** radio button. Click **Next**.

Step 4 When the Remove the Program window appears, click **Remove**.

> **Note** If a User Account Control warning appears, click "Allow - I trust this program..." to proceed.

Step 5 When the InstallShield Wizard Completed window appears click **Finish**.

Connecting to the Auxiliary Port

When a modem is connected to the auxiliary port, a remote user can dial in to the router and configure it. Use a light blue console cable and the DB-9-to-DB-25 connector adapter.

> **Note** The console cable and DB-9-to-DB-25 connector are not included with the
> Cisco ASR 903 Router; they are ordered separately.

To connect a modem to the router, follow these steps:

Step 1   Connect the RJ45 end of the adapter cable to the black AUX port on the router, as shown in Figure 3-23.

Figure 3-23   Connecting a Modem to the Cisco ASR 903 Router
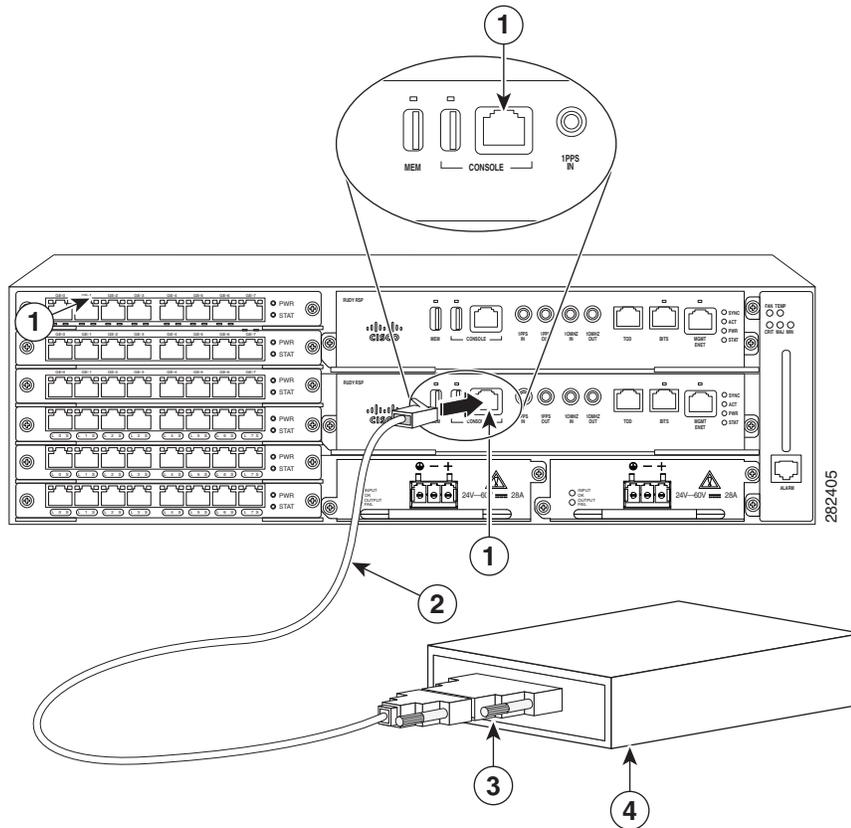
1	RJ45 AUX port	3	RJ45 to DB-9
2	DB-9 to DB-25 adapter	4	Modem

Step 2   Connect the DB-9 end of the console cable to the DB-9 end of the modem adapter.

Step 3   Connect the DB-25 end of the modem adapter to the modem.

Step 4   Make sure that your modem and the router auxiliary port are configured for the same transmission speed (up to 115200 bps is supported) and for mode control with data carrier detect (DCD) and data terminal ready (DTR) operations.

Connecting a Management Ethernet Cable

When using the Ethernet Management port in the default mode (speed-auto and duplex-auto) the port operates in auto-MDI/MDI-X mode. The port automatically provides the correct signal connectivity through the Auto-MDI/MDI-X feature. The port automatically senses a crossover or straight-through cable and adapts to it.

However, when the Ethernet Management port is configured to a fixed speed (10 or 100 Mbps) through command-line interface (CLI) commands, the port is forced to MDI mode.

When in a fixed-speed configuration and MDI mode:

- Use a crossover cable to connect to an MDI port
- Use a straight-through cable to connect to an MDI-X port

⚠

Warning   **To comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety, connect the Management Ethernet ports only to intra-building or unexposed wiring or cable. The intrabuilding cable must be shielded and the shield must be grounded at both ends. The intra-building port(s) of the equipment or subassembly must not be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.**

Installing and Removing SFP and XFP Modules

The Cisco ASR 903 Router supports a variety of SFP and XFP modules, including optical and Ethernet modules. For information on how to install and remove SFP and XFP modules, see the documentation for the SFP or XFP module at

http://www.cisco.com/en/US/partner/products/hw/modules/ps5455/prod_installation_guides_list.html

For information about inspecting and cleaning fiber-optic connections, see
http://www.cisco.com/en/US/partner/tech/tk482/tk876/technologies_white_paper09186a0080254eba.shtml

⚠

Caution   We recommend that you wait 30 seconds between removal and insertion of an SFP on an interface module. This time is recommended to allow the transceiver software to initialize and synchronize with the standby RSP. Changing an SFP more quickly could result in transceiver initialization issues that disable the SFP.

Connecting a USB Flash Device

To connect a USB flash device to the Cisco ASR 903 Router, insert the memory stick in the USB port labeled MEM. The Flash memory module can be inserted in only one way, and can be inserted or removed regardless of whether the router is powered up or not.

Figure 3-24 shows the USB port connector on the Cisco ASR 903 Router.

Figure 3-24   Cisco ASR 903 Router Flash Token Memory Stick
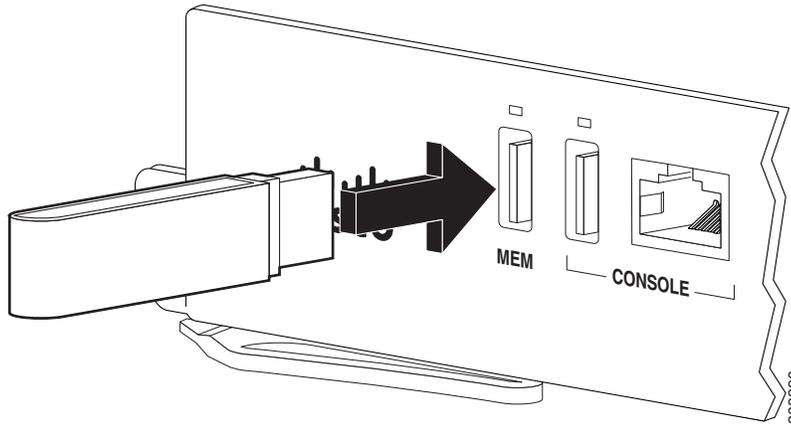
Removing a USB Flash Device

To remove and then replace a USB flash token memory stick from a Cisco ASR 903 Router, follow these steps:

Step 1   Pull the memory stick from the USB port.

Step 2   To replace a Cisco USB Flash memory stick, simply insert the module into the USB port labeled MEM as shown in Figure 3-24 . The Flash memory module can be inserted in only one way, and can be inserted or removed regardless of whether the router is powered up or not.

Note   You can insert or remove the memory stick whether the router is powered on or not.

This completes the USB Flash memory installation procedure.

Connecting Timing Cables

The following sections describe how to connect timing cables to the Cisco ASR 903 Router:

- Connecting Cables to the BITS Interface, page 3-36
- Connecting Cables to a GPS Interface, page 3-38

Note   When installing the cabling to the RSPs, we recommend that you leave a service loop of extra cabling sufficient to allow for fan tray removal.

Connecting Cables to the BITS Interface

The following steps describe how to connect a cable to the router BITS port:

Step 1   Confirm that the router is powered off.

Step 2   Connect one end of the cable to the BITS port using a straight-through, shielded RJ48C-to-RJ48C cable.

Step 3   Connect the other end to the BTS patch or demarcation panel at your site.

Step 4   Turn on power to the router.

For information about the BITS port pinouts, see Chapter 5, "Troubleshooting."

Note   Use of two BITS sources or a Y-cable is optional. Each BITS input port is routed to both RSPs, so that SETS device on each RSP has visibility to both BITS inputs.

Warning   **To comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety, connect the BITS ports only to intra-building or unexposed wiring or cable. The intrabuilding cable must be shielded and the shield must be grounded at both ends. The intra-building port(s) of the equipment or subassembly must not be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.**

Connecting Cables to a GPS Interface

The following sections describe how to connect cables from the Cisco ASR 903 Router to a GPS unit for input or output timing of frequency:

Note   A Y-cable is required to connect to a primary and backup RSP in order to ensure that the router continues to transmit timing signals in the event of a network failure. For a mini-coax connection, this Y-cable can be part number CAB-BNC-7INY (7 inch BNC Y-cable). For an Ethernet connection, this Y-cable can be a RJ45 Cat5 1-to-2 splitter (3 female port RJ45 connector).

Note   When installing the cabling to the RSPs, we recommend that you leave a service loop of extra cabling sufficient to allow for fan tray removal.

Connecting Cables to the Input 10Mhz or 1PPS Interface

Step 1   Connect one end of a mini-coax Y-cable to the GPS unit.

Step 2   Connect one end of the split-side Y-cable mini-coax to the 10Mhz or 1PPS port on the primary RSP of the Cisco ASR 903 Router.

Step 3   Connect the other end of the split-side Y-cable mini-coax to the 10Mhz or 1PPS port on the backup RSP of the Cisco ASR 903 Router.

Connecting Cables to the Output 10Mhz or 1PPS Interface

Step 1   Connect one end of a mini-coax Y-cable to the Slave unit.

Step 2   Connect one end of the split-side Y-cable mini-coax to the 10Mhz or 1PPS port on the primary RSP of the Cisco ASR 903 Router.

Step 3   Connect the other end of the split-side Y-cable mini-coax to the 10Mhz or 1PPS port on the backup RSP of the Cisco ASR 903 Router.

Connecting Cables to the ToD Interface

Step 1   Connect one end of a straight-through Ethernet cable to the GPS unit.

Step 2   Connect one end of the split-side Y-cable Ethernet to the ToD port on the primary RSP of the Cisco ASR 903 Router.

Step 3   Connect the other end of the split-side Y-cable Ethernet to the ToD port on the backup RSP of the Cisco ASR 903 Router.

Note   For instructions on how to configure clocking, see the *Cisco ASR 903 Router Software Configuration Guide*.

Warning   **To comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety, connect the ToD ports only to intra-building or unexposed wiring or cable. The intrabuilding cable must be shielded and the shield must be grounded at both ends. The intra-building port(s) of the equipment or subassembly must not be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.**

Note   For more information about GPS port pinouts, see Chapter 5, "Troubleshooting."

Connecting Ethernet Cables

The Cisco ASR 903 Router interface modules support RJ45 or SFP Ethernet ports. For instructions on how to connect cables to Ethernet SFP ports, see Connecting Cables to SFP Modules, page 3-40.

The RJ45 port supports standard straight-through and crossover Category 5 unshielded twisted-pair (UTP) cables. Cisco Systems does not supply Category 5 UTP cables; these cables are available commercially.

Warning   **To comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety, connect the Gigabit Ethernet ports only to intra-building or unexposed wiring or cable. The intrabuilding cable must be shielded and the shield must be grounded at both ends. The intra-building port(s) of the equipment or subassembly must not be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.**

Note   When installing the cabling to the RSPs, we recommend that you leave a service loop of extra cabling sufficient to allow for fan tray removal.

Follow these steps to connect the cable to a copper Gigabit Ethernet port:

Step 1   Confirm that the router is powered off.

Step 2   Connect one end of the cable to the Gigabit Ethernet port on the router.

Step 3   Connect the other end to the BTS patch or demarcation panel at your site.

Connecting Cables to SFP Modules

For information on connecting cables to Cisco optical and Ethernet SFP interfaces, see

http://www.cisco.com/en/US/partner/products/hw/modules/ps5455/prod_installation_guides_list.html.

Connecting T1/E1 cables

The physical layer interface for the Cisco ASR 903 Router T1/E1 port is a customer-installed high-density connector. The high-density connector has thumbscrews which should be screwed into the interface when the cable is installed.

Figure 3-25 shows the T1/E1 cable connector and Figure 3-26 shows the connection between the T1/E1 interface and the patch panel.

Note   A patch panel is required in order to connect the high-density interface connector to individual T1/E1 lines.

Figure 3-25   T1/E1 Cable Connector
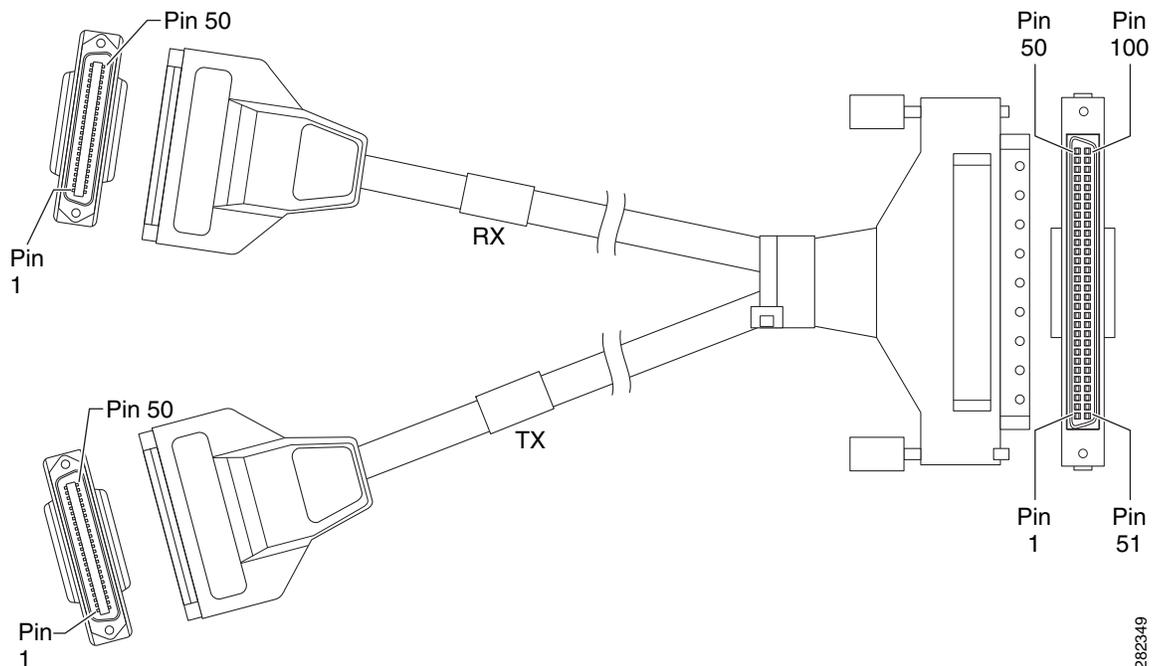
Installing the Cable Connector

One end of the cable has a 100-pin connector that plugs into the T1/E1 interface module. Use the thumbscrews on either side of the connector to secure the cable to the interface.

The other end of the cable has two 50-pin Telco connectors that attach to the rear of a 24-port RJ45 patch panel. Both connectors are identical: one is for Transmit (TX) and the other is for Receive (RX).

Figure 3-26 shows how the cable is connected between the T1/E1 interface module and the patch panel.

Figure 3-26   Cable Installation between T1/E1 Interface and Patch Panel
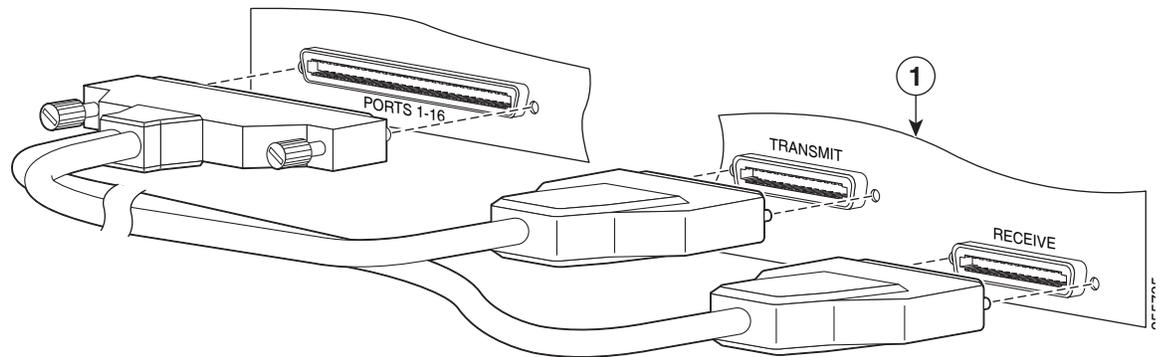
1	Patch panel interfaces

For information about the pinout of the cable connecting the T1/E1 interface to the rear of the patch panel, see the "T1/E1 Port Pinout" section on page 5-4.

RJ45 Cable Pinouts

T1 lines from individual subscribers are attached to RJ45 connectors on the front of the 24-port patch panel. Each RJ45 port accommodates an individual T1 subscriber line.

For the T1/E1 ports, see the "T1/E1 Port Pinout" section on page 5-4.

Connecting Cables to the Patch Panel

If you are connecting two T1/E1 interfaces to each other, you must cable both interfaces' patch panels together using a T1 cross-over cable or a T1 straight-through cable. Use shielded cables. The type of cable you use (cross-over or straight-through) depends on how the T1/E1 interfaces are cabled to their patch panels:

- If both T1/E1 interfaces are connected to their patch panels in the same manner (TX to Transmit and RX to Receive, or TX to Receive and RX to Transmit), use a T1 cross-over cable to connect the patch panels.

- If both T1/E1 interfaces are connected to their patch panels in a different configuration (TX to Transmit and RX to Receive on one interface, and TX to Receive and RX to Transmit on the other interface), use a T1 straight-through cable (standard RJ45 patch cable) to connect the patch panels.

⚠ **Warning**   **To comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety, connect the T1/E1 ports only to intra-building or unexposed wiring or cable. The intrabuilding cable must be shielded and the shield must be grounded at both ends. The intra-building port(s) of the equipment or subassembly must not be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4**

ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.

Recommended Patch Panel

We recommend the following T1/E1 patch panels:

48-port T1 RJ45 patch panel (part number DCC4884/25T1-S)

16-port E1 BNC patch panel (part number DCC16BNC/25T1-S)

The patch panels are available from Optical Cable Corporation (http://www.occfiber.com). To order a patch panel, contact the Sales and Marketing Support staff at Optical Cable Corporation:

- 800-622-7711 (toll-free in the U.S.A.)
- 540-265-0690 (outside the U.S.A.)

Connecting the Fan Tray Alarm Port

The fan tray includes an alarm port that maps to 4 dry contact alarm inputs.

The pins on the alarm port are passive signals and can be configured as Normally Open (an alarm generated when current is interrupted) or Normally Closed (an alarm is generated when a circuit is established) alarms. You can configure each alarm input as critical, major, or minor. An alarm triggers alarm LEDs and alarm messages. The relay contacts can be controlled through any appropriate third-party relay controller. The open/close configuration is an option controlled in IOS.

⚠

Warning   **To comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety, connect the alarm ports only to intra-building or unexposed wiring or cable. The intrabuilding cable must be shielded and the shield must be grounded at both ends. The intra-building port(s) of the equipment or subassembly must not be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.**

Only Pins 1, 2, 4, 6, and 8 are available for customer use. The remaining pins are for Cisco manufacturing test, and should not be connected. Use a shielded cable for connection to this port for EMC protection. Table 5-4 summarizes the pinouts on the alarm port in Chapter 5, "Troubleshooting."

Step 1   Attach an RJ45 cable to the alarm port.

Step 2   Attach the other end of the RJ45 cable to the relay controller.

For information about how to map alarm inputs to critical, major, and minor alarm conditions, see the *Cisco ASR 903 Router Software Configuration Guide*.

Connector and Cable Specifications

For more information on cable specifications and pinouts, see Chapter 5, "Troubleshooting".

Cisco ASR 903 Router Initial Configuration

This chapter guides you through a basic router configuration, which is sufficient for you to access your network. Complex configuration procedures are beyond the scope of this publication and can be found in the modular configuration and modular command reference publications in the Cisco IOS software configuration documentation set that corresponds to the software release installed on your Cisco hardware.

To configure the Cisco ASR 903 Router from a console, you need to connect a terminal to the router console port.

This chapter contains the following sections:

Checking Conditions Prior to System Startup

Ensure that the following conditions are addressed before starting up the router:

- The Route Switch Processor (RSP) is installed.
- The optional Gigabit Ethernet Management port cable is installed.
- The chassis is securely mounted and grounded.
- The power and interface cables are connected.
- Your PC with terminal emulation program (hyperTerminal or equivalent) is connected to the console port and powered up.
- Your PC terminal emulation program is configured for 9600 baud, 8 data bits, 1 stop-bit, no parity, and flow control is set to none.
- You have selected passwords for access control.
- Captive installation screws are tight on all removable components.
- The console terminal is turned on.
- You have determined the IP addresses for the Ethernet and serial interfaces.
- Empty card slots or card bays are filled with card blanks. This ensures proper air flow through the chassis and electromagnetic compatibility (EMC).

Powering Up the Cisco ASR 903 Router

Make certain that all card slots and compartments are closed off. Install blank faceplates on any empty slots. Always have power supply slots filled. If you leave a power supply slot uncovered, then you risk exposure to hazardous voltages on the power pins on the midplane.

Warning   **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 1029

After installing your Cisco ASR 903 Router and connecting cables, start the router and follow these steps:

Step 1   Activate the DC power supply using the steps described in .

Caution   Do not press any keys on the keyboard until the messages stop and the SYS PWR LED is solid green. Any keys pressed during this time are interpreted as the first command typed when the messages stop, which might cause the router to power off and start over. It takes a few minutes for the messages to stop.

Note   **This is only an example of what can display. The system boots differently depending upon the configuration that ships with your system.**

Step 2   Observe the initialization process. When the system boot is complete (the process takes a few seconds), the Cisco ASR 903 Router RSP begins to initialize.

Example 4-1   Loading the Default System Boot Image

```
rommon 1 >
rommon 1 > boot
Located rp_super.ppc.nader.5g.evfc.bin
Image size 211681484 inode num 12, bks cnt 51681 blk size 8*512
################################################################################
#
###########################################
Boot image size = 211681484 (0xc9e00cc) bytes

Using midplane macaddr
Package header rev 0 structure detected
Calculating SHA-1 hash...done
validate_package: SHA-1 hash:
        calculated 479a7d62:6c128ba8:3616b8da:93cb3224:5c1aeb34
        expected   479a7d62:6c128ba8:3616b8da:93cb3224:5c1aeb34
Image validated


PPC/IOS XE loader version: 0.0.3
loaded at:      00800000 0D1E2004
zimage at:      00807673 009B8C69
```

```
initrd at:      009B9000 01006219
isord at:       01007000 0D1DF800
avail ram:      00400000 00800000


Kernel load:
Uncompressing image... dst: 00000000 lim: 00400000 start: 00807673 size:
001B15F6...done.
Now booting the IOS XE kernel


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Software clause at DFARS sec. 252.227-7013.


            cisco Systems, Inc.
            170 West Tasman Drive
            San Jose, California 95134-1706



Router# show version

Cisco IOS Software, IOS-XE Software (PPC_LINUX_IOSD-ADVENTERPRISEK9-M), Version
12.2(33)XNA, RELEASE SOFTWARE
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2008 by Cisco Systems, Inc.
Compiled Thu 01-May-08 00:29 by mcpre
Cisco IOS-XE software, Copyright (c) 1986-2008 by Cisco Systems, Inc.

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or the applicable URL provided on the flyer accompanying the IOS-XE
software.
A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wwl/export/crypto/tool/stqrg.html

If you require further assistance please contact us by sending email to
export@cisco.com.

cisco ASR903 processor with 541737K/6147K bytes of memory.
4 Gigabit Ethernet interfaces
32768K bytes of non-volatile configuration memory.
1869396K bytes of physical memory.
7798783K bytes of eUSB flash at bootflash:.


            --- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: no


Press RETURN to get started!


*Feb 19 17:34:27.361: % Error opening nvram:/ifIndex-table No such file or directory
*Feb 19 17:34:28.235: %ASR1000_MGMTVRF-6-CREATE_SUCCESS_INFO: Management vrf Mgmt-intf
created with ID 4085, ipv4 table-id 0xFF5, ipv6 table-id 0x1E000001
```

```
*Feb 19 17:34:29.720: %PARSER-4-BADCFG: Unexpected end of configuration file.

*Feb 19 17:34:29.809: %NETCLK-5-NETCLK_MODE_CHANGE: Network clock source not
available. The network clock has changed to freerun

*Feb 19 17:34:10.138: %CPPHA-7-SYSREADY: F0: cpp_ha:  CPP client process FMAN-FP (5 of
5) ready.
*Feb 19 17:34:29.824: %LINK-3-UPDOWN: Interface GigabitEthernet0, changed state to up
*Feb 19 17:34:10.269: %IOSXE-6-PLATFORM: F0: cpp_cp:  cpp_mlp_svr_client_bind:
cpp_mlp_svr_ifm_init() successful
*Feb 19 17:34:10.362: %CPPHA-7-START: F0: cpp_ha:  CPP 0 preparing image
/usr/cpp/bin/cpp-mcplo-ucode
*Feb 19 17:34:10.473: %CPPHA-7-START: F0: cpp_ha:  CPP 0 startup init image
/usr/cpp/bin/cpp-mcplo-ucode
*Feb 19 17:34:14.688: %CPPHA-7-START: F0: cpp_ha:  CPP 0 running init image
/usr/cpp/bin/cpp-mcplo-ucode
*Feb 19 17:34:14.919: %CPPHA-7-READY: F0: cpp_ha:  CPP 0 loading and initialization
complete
*Feb 19 17:34:14.919: %CPPHA-6-SYSINIT: F0: cpp_ha:  CPP HA system configuration
start.
*Feb 19 17:34:15.179: %IOSXE-6-PLATFORM: F0: cpp_cp: Process
CPP_PFILTER_EA_EVENT__API_CALL__REGISTER
*Feb 19 17:34:15.286: %CPPHA-6-SYSINIT: F0: cpp_ha:  CPP HA system enabled.
*Feb 19 17:34:15.287: %CPPHA-6-SYSINIT: F0: cpp_ha:  CPP HA system initializaton
complete.
*Feb 19 17:34:30.823: %LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0, changed state to down
*Feb 19 17:35:12.865: %LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state
to administratively down
*Feb 19 17:35:12.865: %LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state
to administratively down
*Feb 19 17:35:12.865: %LINK-5-CHANGED: Interface GigabitEthernet0/0/2, changed state
to administratively down
*Feb 19 17:35:12.865: %LINK-5-CHANGED: Interface GigabitEthernet0/0/3, changed state
to administratively down
*Feb 19 17:35:13.865: %LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/0/0, changed state to down
*Feb 19 17:35:13.865: %LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/0/1, changed state to down
*Feb 19 17:35:13.866: %LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/0/2, changed state to down
*Feb 19 17:35:13.866: %LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/0/3, changed state to down
*Feb 19 17:35:19.167: %ASR1000_OIR-6-REMSPA: SPA removed from subslot 0/0, interfaces
disabled
*Feb 19 17:35:19.171: %ASR1000_OIR-6-INSCARD: Card (fp) inserted in slot F0
*Feb 19 17:35:19.171: %ASR1000_OIR-6-ONLINECARD: Card (fp) online in slot F0
*Feb 19 17:35:19.187: %ASR1000_OIR-6-INSCARD: Card (cc) inserted in slot 0
*Feb 19 17:35:19.187: %ASR1000_OIR-6-ONLINECARD: Card (cc) online in slot 0
*Feb 19 17:35:19.189: %ASR1000_OIR-6-INSSPA: SPA inserted in subslot 0/0
*Feb 19 17:35:19.452: %SYS-5-RESTART: System restarted --
Cisco IOS Software, IOS-XE Software (PPC_LINUX_IOSD-ADVENTERPRISEK9-M), Version
12.2(33)XNA, RELEASE SOFTWARE
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2008 by Cisco Systems, Inc.
Compiled Thu 20-Dec-07 18:10 by mcpre
*Feb 19 17:35:19.455: %SYS-6-BOOTTIME: Time taken to reboot after reload = 78809
seconds
*Feb 19 17:35:19.551: %CRYPTO-6-ISAKMP_ON_OFF: ISAKMP is OFF
*Feb 19 17:35:19.551: %CRYPTO-6-ISAKMP_ON_OFF: ISAKMP is OFF
*Feb 19 17:35:21.669: %DYNCMD-7-CMDSET_LOADED: The Dynamic Command set has been loaded
from the Shell Manager
*Feb 19 17:35:22.221: %CRYPTO-6-ISAKMP_ON_OFF: ISAKMP is OFF
Router>
```

During the boot process, observe the system LEDs. The LEDs on the shared port adapter go on and off in an irregular sequence. Once the router has booted, the green STATUS LED comes on and stays on.

Verifying the Front Panel LEDs

The front-panel indicator LEDs provide power, activity, and status information useful during bootup. For more detailed information about the LEDs, see Chapter 5, "Troubleshooting."

Verifying the Hardware Configuration

To display and verify the hardware features, enter the following commands:

- **show version**—Displays the system hardware version; the installed software version; the names and sources of configuration files; the boot images; and the amount of installed DRAM, NVRAM, and flash memory.
- **show diag slot**—Displays the IDPROM information for the assemblies in the chassis.

Checking Hardware and Software Compatibility

To check the minimum software requirements of the Cisco IOS software with the hardware installed on your Cisco ASR 903 Router, Cisco maintains the Software Advisor tool on Cisco.com. The tool provides the minimum Cisco IOS requirements for individual hardware modules and components.

Note   To access this tool, you must have a Cisco.com login account.

To access the Software Advisor, click **Login** at Cisco.com, type **Software Advisor** in the search box, and click **Go**. Click the link for the Software Advisor Tool.

Choose a product family or enter a specific product number to search for the minimum supported software needed for your hardware.

Configuring the Cisco ASR 903 Router at Startup

This section explains how to create a basic running configuration for your Cisco ASR 903 Router.

Note   You need to acquire the correct network addresses from your system administrator or consult your network plan to determine correct addresses before you can complete the router configuration.

Before continuing the configuration process, check the current state of the router by entering the **show version** command. The **show version** command displays the release of Cisco IOS software that is available on the router.

For information on modifying the configuration after you create it, see the Cisco IOS configuration and command reference guides.

To configure a Cisco ASR 903 Router from the console, you must connect a terminal or terminal server to the console port on the Cisco ASR 903 Router RSP. To configure the Cisco ASR 903 Router using the management Ethernet port, you must have the router's IP address available.

Using the Console Interface

To access the command line interface using the console, follow these steps:

Step 1   Your system is booting and if you answer No, at the prompt:

```
        --- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: no
```

Step 2   Then Press **Return** to enter user EXEC mode. The following prompt appears:

Router>

Step 3   From user EXEC mode, enter the enable command as shown in the following example:

Router> enable

Step 4   At the password prompt, enter your system password. If an enable password has not been set on your system, this step may be skipped. The following example shows entry of the password called *enablepass*:

Password: enablepass

Step 5   When your enable password is accepted, the privileged EXEC mode prompt appears: Router#

Step 6   You now have access to the CLI in privileged EXEC mode and you can enter the necessary commands to complete your desired tasks. To exit the console session, enter the quit command as shown in the following example:

Router# quit

Configuring Global Parameters

When you first start the setup program, you must configure the global parameters. These parameters are used for controlling system-wide settings. Perform the following steps to enter the global parameters:

Step 1   Connect a console terminal to the console port, and then boot the router.

Note   This is only an example of the output display; prompts may vary.

When you see this information, you have successfully booted your router:

```
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            cisco Systems, Inc.
            170 West Tasman Drive
        San Jose, California 95134-1706
.
.
.
        --- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: yes


Press RETURN to get started!
```

Step 2 The first sections of the configuration script appear only at an initial system startup. On subsequent uses of the setup facility, the script begins with a System Configuration Dialog as shown below: When asked if you would like to enter the initial configuration dialog, enter **yes**.

```
Would you like to enter the initial configuration dialog? [yes/no] yes

At any point you may enter a question mark '?' for help.
Use ctrl-c to abort configuration dialog at any prompt.
Default settings are in square brackets '[]'.

Basic management setup configures only enough connectivity for management of the
system, extended setup will ask you to configure each interface on the system.
```

Basic management setup configures enough connectivity for managing the system; extended setup will ask you to configure each interface on the system. For detailed information about setting global parameters, refer to the *Cisco ASR 903 Router Software Configuration Guide.*

Checking the Running Configuration Settings

To check the value of the settings you have entered, enter the **show running-config** command at the Router# prompt:

Router# **show running-config**

To review changes you make to the configuration, use the EXEC mode **show startup-config** command to see the changes and copy run-start stored in NVRAM.

Saving the Running Configuration to NVRAM

To store the configuration or changes to your startup configuration in NVRAM, enter the copy running-config startup-config command at the Router# prompt:

Router# copy running-config startup-config

Using this command saves the configuration settings that you created in the router using configuration mode and the setup facility. If you fail to do this, your configuration will be lost the next time you reload the router.

Safely Powering Off the Cisco ASR 903 Router

This section explains how to shut down the Cisco ASR 903 Router. It is recommended that before turning off all power to the chassis, you issue the **reload** command. This insures that the operating system cleans up all the file systems. Once the reload operation is complete, then the Cisco ASR 903 Router can be powered off safely.

To remove power from the Cisco ASR 903 Router safely, follow this procedure and see the examples:

Step 1   Slip on the ESD-preventive wrist strap that was included in the accessory kit.

Step 2   Enter the **reload** command.

Step 3   Confirm the reload command.

```
Rmcp-6ru-1#reload
Proceed with reload? [confirm]
Aug 17 00:06:47.051 R0/0: %PMAN-5-EXITACTION: Process manager is exiting: prs exit
with reload chassis code
```

Step 4   After confirming the reload command, wait until the system bootstrap message displays before powering off the system.

```
System Bootstrap, Version 12.2(33r)XN2, RELEASE SOFTWARE (fc1)
Technical Support: tap://www.cisco.com/techsupport
Copyright (c) 2008 by cisco Systems, Inc.

Current image running: Boot ROM0
Last reset cause: LocalSoft

ASR1000-RP1 platform with 4194303 Kbytes of main memory

mcp-6ru-1-rp0-rommon 1>
```

Step 5   Remove any power cables from the Cisco ASR 903 Router.

  a.   For power supplies with a circuit breaker switch, position the switch to the Off (O) position.

  b.   For power supplies with a Standby switch, place the Standby switch in the Standby position.

Note   After powering off the router, wait a minimum of 30 seconds before powering it on again.

Troubleshooting

The following sections provide information for troubleshooting problems on the Cisco ASR 903 Router.

Pinouts

The following sections describe the pinouts for the Cisco ASR 903 Router interfaces:

BITS Port Pinout

Table 5-1 summarizes the BITS port pinout.

Table 5-1   BITS Port Pinout

Pin	Signal Name	Direction	Description
1	RX Ring	Input	Receive Ring
2	RX Tip	Input	Receive Tip
3			Not used
4	TX Ring	Output	TX Ring
5	TX Tip	Output	TX Tip

Table 5-1   BITS Port Pinout (continued)

Pin	Signal Name	Direction	Description
6			Not used
7			Not used
8			Not used

GPS Port Pinout

Table 5-2 summarizes the GPS port pinouts.

Table 5-2   GPS Port Pinout

	10 Mhz (input and output)	1PPS (input and output)
Waveform	Input—Sine wave Output—Square wave	Input—Pulse shape Output—Pulse shape
Amplitude	Input— > 1.7 volt p-p (+8 to +10 dBm) Output— > 2.4 volts TTL compatible	Input— > 2.4 volts TTL compatible Output— > 2.4 volts TTL compatible
Impedance	50 ohms	50 ohms
Pulse Width	50% duty cycle	26 microseconds
Rise Time	Input—AC coupled Output—5 nanoseconds	40 nanoseconds

Time of Day Port Pinout

Table 5-3 summarizes the ToD/1PPS port pinout.

Table 5-3   RJ45 1PPS/ToD Port Pinout

Pin	Signal Name	Direction	Description
1	1PPS_P	Output or Input	1PPS RS422 signal
2	1PPS_N	Output or Input	1PPS RS422 signal
3	RESERVED	Output	Do NOT connect
4	GND		
5	GND		Time of Day character
6	RESERVED	Input	Do NOT connect

Table 5-3   RJ45 1PPS/ToD Port Pinout (continued)

Pin	Signal Name	Direction	Description
7	TOD_P	Output or Input	Time of Day character
8	TOD_N	Output or Input	Time of Day character

Alarm Port Pinout

Table 5-4 summarizes the external alarm input pinout.

Table 5-4   External Alarm Input Pinout

Pin	Signal Name	Description
1	ALARM0_IN	Alarm input 0
2	ALARM1_IN	Alarm input 1
3		No connect
4	ALARM2_IN	Alarm input 2
5	ALARM3_IN	Alarm input 3
6		No connect
7		No connect
8	COMMON	Alarm common

Console/Aux RJ45 RS232 Serial Port Pinout

Table 5-5 summarizes the console/aux RJ45 RS232 serial port pinout.

Table 5-5   Console/Aux RJ45 RS232 serial port

Pin	Signal Name	Direction	Description
1	RTS	Output	Request to send
2	DTR	Output	Data Terminal Ready (always On).
3	TXD	Output	Transmit data
4	RI		Ring Indicator
5	GND		
6	RXD	Input	Receive data
7	DSR/DCD	Input	Data set ready/Data Carrier detect
8	CTS	Input	Clear to send

T1/E1 Port Pinout

Table 5-6 summarizes the pinouts of the cable (Tyco part number 2163442-1, Cisco part number 72-5184-01) used to connect the T1/E1 interface module to the rear of the patch panel.

Table 5-6 *T1/E1 Interface Pinouts*

Line	Board Pins	Signal Name	Telco TX	Jack Pin		Board Pins	Signal Name	Telco RX	Jack Pin
Line 0	51	TX_RING_P12	26	1		55	RX_RING_P12	26	4
	1	TX_TIP_P12	1	2		5	RX_TIP_P12	1	5
Line 1	52	TX_RING_P11	27	1		56	RX_RING_P11	27	4
	2	TX_TIP_P11	2	2		6	RX_TIP_P11	2	5
Line 2	61	TX_RING_P16	28	1		57	RX_RING_P16	28	4
	11	TX_TIP_P16	3	2		7	RX_TIP_P16	3	5
Line 3	62	TX_RING_P15	29	1		58	RX_RING_P15	29	4
	12	TX_TIP_P15	4	2		8	RX_TIP_P15	4	5
Line 4	63	TX_RING_P10	30	1		67	RX_RING_P10	30	4
	13	TX_TIP_P10	5	2		17	RX_TIP_P10	5	5
Line 5	64	TX_RING_P9	31	1		68	RX_RING_P9	31	4
	14	TX_TIP_P9	6	2		18	RX_TIP_P9	6	5
Line 6	73	TX_RING_P14	32	1		69	RX_RING_P14	32	4
	23	TX_TIP_P14	7	2		19	RX_TIP_P14	7	5
Line 7	74	TX_RING_P13	33	1		70	RX_RING_P13	33	4
	24	TX_TIP_P13	8	2		20	RX_TIP_P13	8	5
Line 8	75	TX_RING_P4	34	1		79	RX_RING_P4	34	4
	25	TX_TIP_P4	9	2		29	RX_TIP_P4	9	5
Line 9	76	TX_RING_P3	35	1		80	RX_RING_P3	35	4
	26	TX_TIP_P3	10	2		30	RX_TIP_P3	10	5
Line 10	85	TX_RING_P8	36	1		81	RX_RING_P8	36	4
	35	TX_TIP_P8	11	2		31	RX_TIP_P8	11	5
Line 11	86	TX_RING_P7	37	1		82	RX_RING_P7	37	4
	36	TX_TIP_P7	12	2		32	RX_TIP_P7	12	5
Line 12	87	TX_RING_P2	38	1		91	RX_RING_P2	38	4
	37	TX_TIP_P2	13	2		41	RX_TIP_P2	13	5
Line 13	88	TX_RING_P1	39	1		92	RX_RING_P1	39	4
	38	TX_TIP_P1	14	2		42	RX_TIP_P1	14	5
Line 14	99	TX_RING_P6	40	1		93	RX_RING_P6	40	4
	49	TX_TIP_P6	15	2		43	RX_TIP_P6	15	5

Table 5-6   T1/E1 Interface Pinouts (continued)

Line 15	100	TX_RING_P5	41	1		94	RX_RING_P5	41	4
	50	TX_TIP_P5	16	2		44	RX_TIP_P5	16	5

Figure 5-1 shows the wiring schematic of the cable used to connect the T1/E1 interface module to the rear of the patch panel.

Figure 5-1   Wiring Schematic of Cable between T1/E1 Interface and Patch Panel
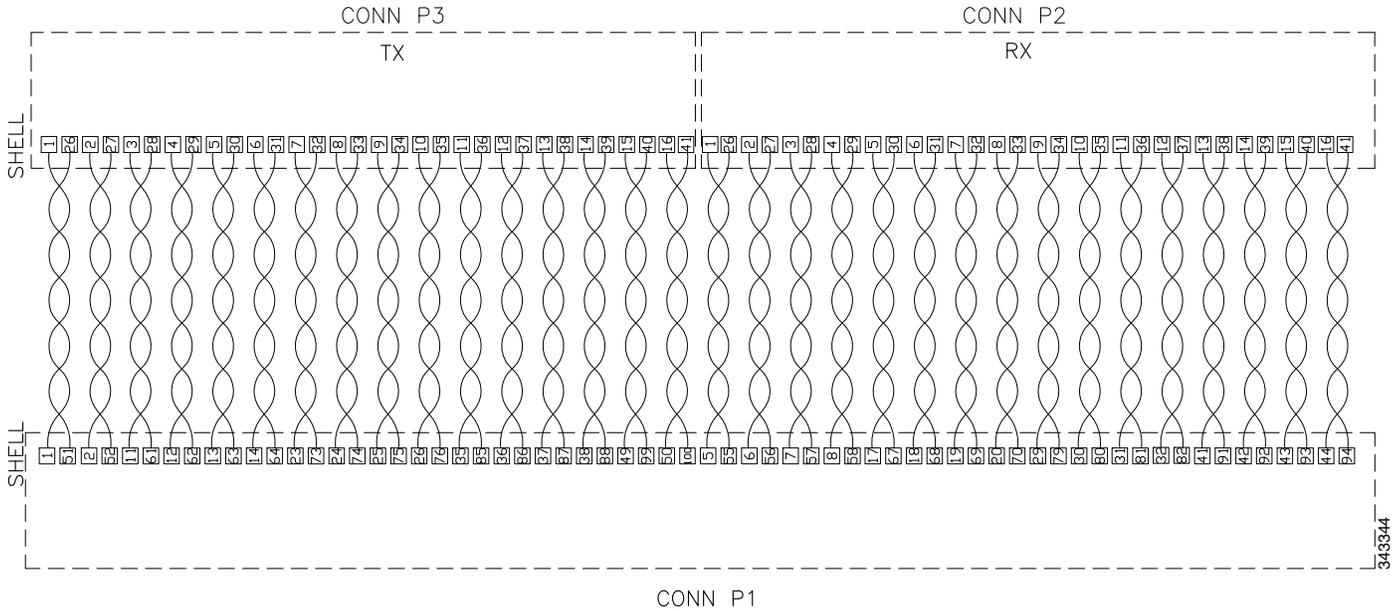
Management Ethernet Port Pinout

Table 5-7 summarizes the Management Ethernet port pinout.

Table 5-7   Fan Tray Alarm Port Pinout

Pin	Signal Name	Description
1	TRP0+	
2	TRP0-	
3	TRP1+	
4	TRP2+	
5	TRP2-	
6	TRP1-	
7	TRP3+	
8	TRP3-	

USB Console Port Pinout

Table 5-8 summarizes the USB console port pinout.

Table 5-8   Single USB Console Port

Pin	Signal Name	Direction	Description
A1	Vcc		+5VDC (500mA)
A2	D-		Data -
A3	D+		Data +
A4	Gnd		Ground

Note   The USB Console port +5VDC is input and operates as an USB peripheral device.

USB Flash/MEM Port Pinout

Table 5-9 summarizes the USB flash/MEM port pinout.

Table 5-9   Single USB Flash/MEM Port

Pin	Signal Name	Direction	Description
A1	Vcc		+5VDC (500mA)
A2	D-		Data -
A3	D+		Data +
A4	Gnd		Ground

Note   USB TYPE-A receptacle used.

Note   The USB flash/MEM port +5VDC is output. We provide power for USB flash/MEM, and it operates as a USB host device.

Fiber-Optic Specifications

The specification for optical fiber transmission defines two types of fiber: single-mode and multimode. Within the single-mode category, three transmission types are defined: short reach, intermediate reach, and long reach. Within the multimode category, only short reach is available. For information about optical SFP modules, see the documentation for the SFP module at

http://www.cisco.com/en/US/partner/products/hw/modules/ps5455/prod_installation_guides_list.html.

LED Summary

The following sections describe the meanings of the LEDs on the Cisco ASR 903 Router.

RSP LEDs

Table 5-10 summarizes the RSP LEDs.

> **Note** A major alarm condition indicates the failure of a single fan in the fan tray; a critical alarm indicates the failure of multiple fans. In the event that a single fan fails, the Cisco ASR 903 Router software adjusts the fan speed to prevent excessive heat within the chassis.

Table 5-10   *RSP LEDs*

LED	Color/State	Description (two LEDs for eachT1/E1 port)
Power (PWR)	Off	Disabled/no power to RSP
	Green	Power rails on RSP in range
Status (STAT)	Off	Disabled/power down
	Red	Failure to boot (lit at reset)
	Yellow	Rommon booted
	Green	IOS booted and running
Active (ACTV)	Off	Not available
	Yellow	Standby (indicates standby RSP)
	Green	Active (indicates active RSP)
Management port (MGMT)	Off	No connection
	Green	Connected with no activity
	Flashing green	Connected with activity
Sync status (SYNC)	Off	Not enabled
	Yellow	Free run

Table 5-10   RSP LEDs (continued)

LED	Color/State	Description (two LEDs for eachT1/E1 port)
	Flashing yellow	Holdover
	Green	Locked to source
USB flash (MEM)	Flashing green	USB activity
BITS	Off	Out of service/not configured
	Amber	Fault or loop condition
	Green	In frame/working properly

Interface Module LEDs

Table 5-11 summarizes the interface module LEDs. This LED summary applies to the following interface modules:

- SFP Gigabit Ethernet Interface Module
- RJ45 Gigabit Ethernet Interface Module
- XFP 10 Gigabit Ethernet XFP Interface Module

Table 5-11   Interface Module LEDs

LED	Color/State	Description
Power (PWR)	Off	Disabled/no power to IM
	Green	Enabled and power rails on IM in range
Status (STAT)	Off	Disabled/power-down
	Red	Failure (on at reset)
	Amber	Booting (if local CPU)
	Green	Operational
Link status (L)	Off	Inactive or no connection
	Amber	Fault/loop condition
	Green	Ok with no activity
	Flashing green	OK with activity
Speed (S)	Off	100/10 Mbps/Slow
	Green	1Gbps/Full

OC-3 Interface Module LEDs

Table 5-13 summarizes the LEDs for the OC-3 interface module.

Table 5-12   Interface Module LEDs

LED	Color/State	Description
Power (PWR)	Off	Disabled/no power to IM
	Green	Enabled and power rails on IM in range
Status (STAT)	Off	Disabled/power-down
	Red	Failure (on at reset)
	Amber	Booting (if local CPU)
	Green	Operational
Carrier/ Alarm (C/A)	Green	SFP receiving good remote signal
	Yellow	Remote or local alarm activated
Active/ Loopback (A/L)	Green	SFP ready and operating normally
	Yellow	SFP port in loopback state

T1/E1 Interface Module LEDs

Table 5-13 summarizes the LEDs for the T1/E1 interface module.

Table 5-13   T1/E1 Interface Module LEDs

LED	Color/State	Description (two LEDs for eachT1/E1 port)
Active	Green	Active
	Blinking green	Standby
	Off	Operationally down; card is disabled or shut down
Port	Green	All ports up
	Blinking green	All ports up and one or more ports in a loopback state
	Amber	One or more configured ports are down
	Blinking amber	One or more configured ports are down and at least one configured port is in a loopback state
	Off	All ports disabled or shut down

Power Supply LEDs

Table 5-15 summarizes the power supply LEDs for both the AC and DC power supplies.

Table 5-14   Power Supply LEDs

LED	Color/State	Description
Input OK	Off	No Input Voltage
	Amber	Input voltage out of range
	Green	Input voltage within acceptable operating range
Output Fail	Off	Disabled/Forced Shut down/No input power
	Red	Power supply fault (internal failure such as over temperature)
	Green	Operational

Table 5-15   Power Supply LEDs

LED	Color/State	Description
Input Power (PWR)	Off	No input voltage
	Amber	Input voltage out of range
	Green	Input voltage within acceptable operating range
Status (STAT)	Off	Disabled/power-down/no power
	Red	Power supply fault (internal failure)
	Green	Operational

Fan Tray LEDs

Table 5-16 summarizes the fan tray LEDs.

Table 5-16   Fan Tray LEDs

LED	Color/State	Description
Status (TEMP)	Off	Disabled/power down
	Amber	Over temperature
	Green	OK
Fan (FAN)	Green	Fan rotation in range
	Amber	Fan fault
	Red	Two or more fan faults
Minor (MIN)	Off	No minor alarm
	Amber	Minor alarm
Major (MAJ)	Off	No major alarm
	Red	Major alarm

Table 5-16   Fan Tray LEDs

LED	Color/State	Description
Critical (CRIT)	Off	No critical alarm
	Red	Critical alarm (defaults to ON upon RSP reset)

Alarm Conditions

Table 5-17 summarizes the meaning of alarm conditions on the Cisco ASR 903 Router.

Table 5-17   Alarm Condition Summary

Alarm Type	Alarm Meaning
Critical	RSP OIR
	Power supply OIR
	Port in down state
	Environmental sensor threshold exceeded (voltage, temperature)
	IM OIR
	IM crash
Major	Standby RSP in ROMmon mode
	RSP removed
	RSP failure
Info	Port administratively shut down

Site Log

Use the Site Log to provide a record of actions related to installing and maintaining the router. Keep it in an accessible place near the chassis so that those who performs tasks have access to it. Use the Installation Checklist (see the "Site Planning" section on page 2-9) to verify the steps in the installation and maintenance of your router. Site Log entries might include the following:

- Installation progress—Make a copy of the Cisco ASR 903 Router Installation Checklist, and insert it into the Site Log. Make entries as you complete each task.

- Upgrade, removal, and maintenance procedures—Use the Site Log as a record of ongoing router maintenance and expansion history. Each time a task is performed on the Cisco ASR 903 Router, update the Site Log to reflect the following:

    - Removal or replacement of interface modules, fan tray, power supplies, or RSPs

    - Configuration changes

    - Maintenance schedules and requirements

    - Maintenance procedures performed

    - Intermittent problems

    - Comments and notes

Table A-1 on page A-2 shows a sample site log. Make copies of the sample or design your own site log to meet the needs of your site and equipment.

Table A-1   Site Log

Date	Description of Action Performed or Symptom Observed	Initials

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